REGIONAL OFFICE FOR ASIA AND THE FAR EAST

TIGERPAPER

VOL III NO 2 APRIL 1976

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

UNITED NATIONS ENVIRONMENT PROGRAMME

TIGERPAPER is a quarterly newsbulletin dedicated to the exchange of information relating to wildlife and national parks management for the Asia-Pacific region. TIGERPAPER is compiled, edited, and distributed by Peter E. Enderlein, Acting Regional Wildlife and National Parks Management Officer, under the FAO Regional Priority Programme for Asia and the Far East, with assistance for this issue by J.F. Maxwell. Financial assistance is provided by UNEP.

TIGERPAPER
FAO Regional Office for Asia and the Far East
Maliwan Mansion, Phra Atit Road
Bangkok 2, Thailand

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CONTENS

Tigertorial 1

Ecology: Conservation of Diversity, II..... 2

Conservation: Gir Forest and the Asiatic Lion 5
Christmas Island..... 24
Mongolia 25
Indonesia..... 32

Forests: Himalayas 8

Parks: Sagarmatha National Park .. 9

Wildlife: Game Ranching in India ... 10

Animals: Rhinoceros 12
Elephant.....14, 15, 31
Otters..... 16
Pheasants 32

Tigertips: Counting Wild Animals 17
Hatching of Gharials 20

Tigerechoes 22

Tigernotes 23

Publications: Newsletters, reviews, etc.... 26
Major Floras of the Region . 28

News From WWF/IUCN..... 30

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TIGERTORIAL

In TIGERPAPER II:3 we had a note on the kouprey (*Bos sauveli*) and raised some hope that this highly endangered bovide might still be encountered in Thailand. Ever since we received the information supporting this statement we have been looking for an opportunity to go to the area where the alleged sighting was made and to follow up on the report, but it was not until 8 April 1976 that we finally could leave Bangkok on a joint mission with the Thai Royal Forest Department.

The original sighting was reported to us as having been made by a hunter and although we could not locate this person we were very lucky to find several local hunters in the town of Kantaralak in Si Saket Province in eastern Thailand who confirmed this report. According to them at least 30 kouprey, in several small groups, entered Thailand from Cambodia during the monsoon months of 1975 and stayed for some time grazing in the Chong Bat Lak area in the Dongrak Mountain Range. They further believed that this was part of an annual migration pattern for some kouprey in northern Cambodia and that these animals regularly climb the Dongrak Mountains during the monsoon when their grazing grounds on the Cambodian plains become overgrown with tall, coarse, grasses. In addition to the encouraging information on kouprey, these hunters told us that Eld's deer, another endangered species, are quite common in these mountains.

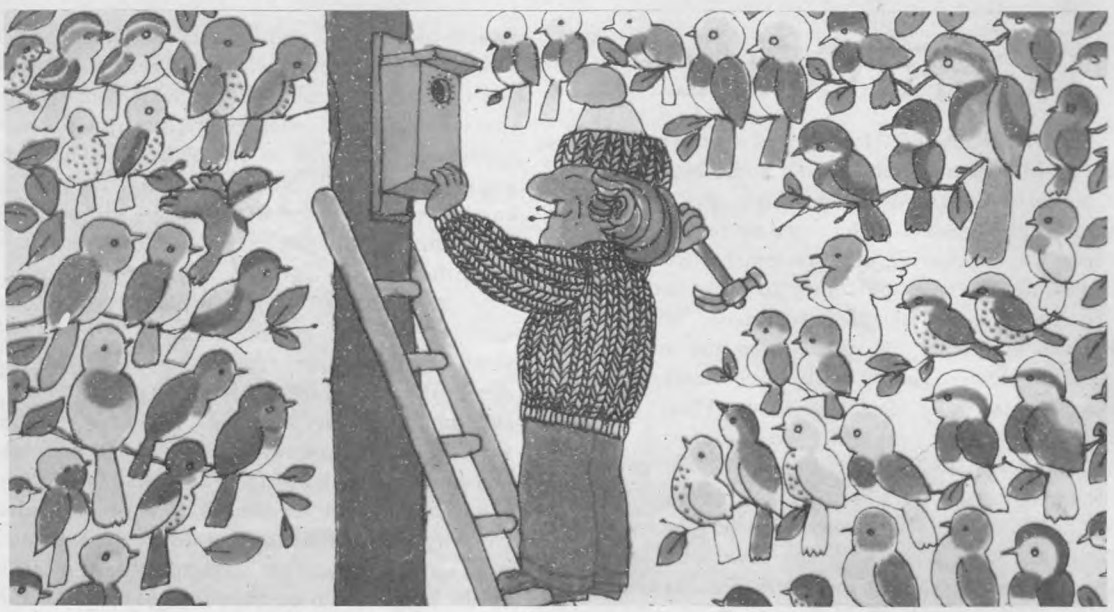
Although we were told that it was still too early in the year for seeing kouprey in the Dongrak Mountains we, nevertheless, enthusiastically decided to go and have a look at the habitat and try to find further evidence to support the information received so far. So, equipped with a landrover and three guides we found our way into the forested slopes of the range following logging trials and when driving was no longer possible we continued on foot backpacking all our provisions.

Unfortunately, the dry evergreen forest on the Thai side of this massive sandstone plateau is being rapidly destroyed by logging operations. Migrant farmers, moving in along the logging trials, complete the devastation with their swidden agriculture and charcoal ovens. Further up the escarpment the vegetation changes into dry dipterocarp and deciduous formations, which are of less economic importance and thus, so far, remain reasonably intact. At the time of our visit, which coincided with the height of the dry season, many trees and shrubs were leafless, and the ground blackened from recent fires. Interspersed with the woody vegatation we found large areas of open savannah which have developed on shallow soils were the sandstone-conglomerate bedrock is exposed. Isolated thickets of scrub, most of which are evergreen species with coriaceous leaves, occupy the sandy depressions and pits in the bedrock. The general impression is of open country, often of a park-land character, with vegetation of grasses and other herbs forming suitable grazing grounds for kouprey and other large herbivores.

And indeed, we found plenty of tracks and spoor indicating the presence of gaur, banteng, sambar and other deer, wild boar, etc. and our guides showed us some foot marks imprinted in the soil during the last monsoon, which were claimed to be those of kouprey. At the top of the plateau at Chong Bat Lak not far from Khao Pra Wihan — a famous ancient temple which is now in ruins — we saw several trials leading down the escarpment into Cambodia and we were told these were used by the kouprey during their forages into Thailand.

Several permanent streams fed by aquifers on top of the plateau meander down both sides of the mountain range. The water flows directly on top of the sandstone which in places has eroded to form potholes and other unusual erosion features and even under severe dry conditions there is sufficient water for animals and people to drink. Although we saw neither kouprey nor Eld's deer, we believe the presence of these animals in the area should not be ruled out and in view of the endangered status of these species we find it justified to recommend that as large a part as possible of the Dongrak Range should be set aside as a wildlife sanctuary by the Thai Government. The Dongrak Mountains, further, have a rather unique topography and some of the views from the top of the plateau are breathtakingly beautiful. We feel, therefore, that part of the area might also prove suitable for the establishment of a national park. With plans to recommend such developments to the Thai Government, we plan a second expedition into the area in order to collect additional data in supoprt of this proposal and find further evidence of the presence of kouprey and Eld's deer. Therefore, some time during June or July, when the monsoon has arrived and the kouprey begin to migrate into Thailand, you will know were to find us and also understand why the July issue of TIGERPAPER might be late in arriving.

Bos sauveli



THE CONSERVATION OF DIVERSITY – II

Warren Y. Brockelman

Diversity must be the ethic of conservation. The idea of a "diversity ethic," recently espoused by Wilson and Willis (1975), goes back to earlier writers, but it has taken on a tremendous urgency with the recent advent of biogeographical theory. Diversity is a practical, not merely philosophical, concept. As I described in my first article (TIGER-PAPER, Vol. III, No. 1), saving the species of the earth will be an extremely difficult holding action at best. It can be predicted that more and more species will became extinct as their habitat areas shrink in size. The major revelation of biogeographical theory is that the diversity of species of all land masses of the earth, from continents down to small islets, has tended to reach (or chase) equilibrium levels over evolutionary time through the adjustment of rates of appearance (speciation and immigration) and disappearance (extinction, either local or complete). Detailed comparisons of similar communities in different parts of the world are providing much evidence that communities are not haphazard collections of species, but selected groups (or "guilds") of species whose niches are compatible with one another and distributed more or less evenly over the total resource spectrum of the environment. The maximum number species that a given environment accommodates is a complex function of a variety of factors: its area, variety of habitat types available, productivity and height of the vegetation, and nearness to a source of new species capable of immigrating into the area. Anyone interested in knowing how advanced the state of the art of this branch of ecology is should read the stimulating collection of papers edited by Cody and Diamond (1975).

Several biogeographers have written recently about how to design wildlife reserves so as to minimize the loss of species through extinction (Diamond, 1972, 1975; Terborgh, 1974; Wilson and Willis, 1975). Basically, the general conclusions are as follows:

(1) Reserves should be as large as possible. A few large sanctuaries are better than a greater number of smaller ones of equivalent total area.

(2) Reserves should be as compactly shaped as possible. An irregular or elongated area may lose species faster than a more round or compact area.

(3) Smaller reserves should be grouped near each other so that emigrants from one will be more likely to colonize another.

(4) If possible, reserves should be connected by corridors of forest to facilitate dispersal and recolonization. Small patches between larger reserves may also act as "stepping stones" for immigrants.

These conclusions should be regarded as tentative because there is still some debate continuing in the ecological literature over biogeographical theory and its particular applications to conservation. For example Simberloff and Abele (1976) have recently maintained that two small reserves may actually save more species than one large site of equivalent area because they may permit survival of separate samples of the mainland species pool, and reduce interspecific competition. This would most likely be true if the number of species one island can accommodate is relatively small compared to the potential number of colonizing species. The clarifying and sharpening of these conclusions must still await additional experimental work and mathematical models addressing these particular aspects.

The fine points of these arguments may strike conservationists as somewhat academic, since it is seldom possible to carefully plan the

layout of reserved areas in an optimal way. It is usually a difficult political fight to get any more relatively undisturbed ecosystems saved for posterity. But the lesson from community ecology is that we need to fight harder than ever to get areas as large as possible and as many areas as possible; and at no point can we rest satisfied that we have enough area, unless we are willing to be satisfied with fewer species. The analysis of trends in diversity on islands of various types sug gests that most species may eventually become extinct within a few thousand years unless we have many reserves of thousands of square kilometers in area. Unique and limited types of habitats such as marshes, swamps, and special breeding areas should be saved in their entirety.

TRAMPS AND HOMEBODIES

It is clear that different kinds of organisms have different probabilities of extinction and colonization. Although the "species pool" is sometimes treated by biogeographers as though all its species were equally available for colonization, for mathematical simplicity, this is far from true. Bird residents of mature forests, for example, tend to be very sedentary and make few forays across more open areas. These species tend to become extinct more easily. Also, species that have narrow or restricted habitat requirements, large territory sizes (particularly predators), competition from other related species, and which are not seasonally migratory all tend to become extinct more readily on islands. We can expect that these species will hesitate to cross open land areas to colonize new forest patches. McClure (1974) has indeed found that many bird species are highly sedentary and can be trapped year after year in their local territories in tropical forests. Although they have powers of flight, these avian homebodies often seem to travel less distance away from home than many less mobile animals, such as salamanders, frogs, and snakes.

A large proportion of birds, on the other hand, are considered to be biogeographical "tramps", and more frequently venture farther away in search of new places to settle down. These are birds adapted to forest borders, disturbed habitats, and earlier stages of ecological succession. In order to persist, these species must naturally search for new suitable habitats when succession or further disturbance replaces their home areas with less suitable vegetation. Such species include most of the common birds of the countryside that one does not have to penetrate into the forest to find. They have undoubtedly benefited and increased in abundance wherever man has modified the landscape. Small islands typically contain relatively more tramp species than denizens of more stable forests, because immigration rates of the former are higher. We probably need not worry so much about the tramps in designing wildlife reserves; it is the mature forest species, which include many exotic sorts (trogons, birds of paradise, large woodpeckers, broadbills, barbets, hornbills, frogmouths, owls, most babblers, many birds of prey, etc.) that will decline in diversity in a manner similar to those in offshore island communities.

Mammals of the forest reach population sizes roughly similar to those of birds, and it is not difficult to imagine that they will also be rather susceptible to extinction, unless they are able to wander through open countryside successfully. Brown (1971) has found that mammal communities that inhabit the boreal environments of mountain top "islands" of the Sierra Nevada (southwestern U.S.) have rather variable and apparently nonequilibrial diversities because these species do not cross the arid habitats at low elevations to get to other mountains. Only extinctions, and not colonizations, have been occurring since their dispersal during the Pleistocene. Who could imagine an adventurous mouse deer, tapir, gibbon, or tiger getting across several hundred kilometers of rice or suger cane fields without tragic human interference? For many types of animals, extinction rates are likely to exceed immigration rates in "island" sanctuaries. Many of these animals may be able to persist longer with thoughtful human management to insure that their habitat and food requirements are taken care of and to reintroduce them from other areas if they become locally extinct.

Perhaps insects will prove exceptional, although here also we can expect to find sedentary species (in the deep forest) and tramps (requiring weeds or secondary growth plants). It is well known that many insect species specialize in dispersal; thus it is a necessary gamble in their life histories when their favorite food plants disappear from one place and appear in another every generation or so. The tramps must follow the weeds. However, the ecology of insect species of the stable forest is much less well understood.

Speaking of weeds, these organisms do not require much intentional care. We can be thankful for them — they are actually among the most valuable plants to mankind, but we seldom seem to be able to distinguish our ecological friends from foes. What would the landscape look like if it were not for weedy plants? It would be mostly scorched, bare, and rocky; not being able to recover from our incessant cutting, trampling, and digging. Weedy plants give the ecosystem its homeostasis, and fortunately there is some hearty type that will sprout on virtually every bare patch of ground. Weedy plant species characterizing disburbed environments or secondary growth have characteristics which make them good colonizers: a short generation time, high seed production, sun tolerance, and flexible growth characteristics which enable them to invade diverse types of habitats.

For plants that make up the stable (undisturbed) forest, the story is different. The climax forest species disappear very quickly with disturbance because of their longer generation times, often lower reproductive potentials, and restricted colonizing abilities. Most species in a mature forest also require the unique environmental characteristics of the undisturbed forest for their survival; including adequate shade, humidity, growing sites, and animals which pollinate and disperse them. Many of these species may become threatened even with selective logging. The commercially valuable canopy tree species are especially important to the ecology of the forest in providing sites for epiphytic ferns, orchids, mosses, etc, and in providing shade and humidity required by understory species. Animals are equally dependent on these forest giants in a large variety of ways.

We know practically nothing about extinction rates in plant communities; the biogeographical theory recently developed for animal communities has not yet been tested with plants. This undoubtedly represents an exciting new frontier for plant ecological research. I suspect that we will soon see attempts to construct immigration-extinction models for plant communities. Competition is much more obvious in plant communities than in animal communities, so extinction events are *a priori* likely to be very important in the regulation of plant species diversity. There are not as many conservation organizations concerned about plant extinctions as about animal extinctions. I do not know whether this is because plant extinctions go unnoticed and unheralded by great fanfare, or because plant extinction rates are just lower. Tropical botanists know that many plant species in forest communities are rare or unaccountably widely scattered in distribution, which makes the safeguarding of large areas very important to the conservation of many plant species.

CENSUSES

It is of the utmost importance for us to census the species present in every reserved area of forest or other habitat. For most invertebrate groups, this will be difficult or even impossible, but it should not be too difficult for the vertebrates. Most forest areas that have become isolated must now have more than their equilibrium number of species, and we can expect extinctions to occur. A complete species count every decade, in the spirit of the human population censuses, would be extremely valuable in monitoring the decline of species, and would aid management and conservation policy. Species losses may be significant over a period of ten years. Diamond (1971) found the extinction rates for birds on the islands of Karkar (368 square km), off New Guinea, and Santa Cruz (249 square km), off California, to be, respectively, 0.32 and 0.20 percent of the total bird faunas per year. Each diversity census should also provide information on the preferred type of habitat and relative abundance of each species.

Most countries in Southeast Asia probably have bird watching groups which might be interested in monitoring bird species diversity in sanctuaries and other forested areas. The considerable talent of many amateurs for recognizing species can be of great benefit to conservation efforts. Surveys should be as complete as possible, however, and may require several years for completion and publication. A few half-hearted or limited enumerations are of limited value to future biogeographers, since what species are not present is just as important as what species are present, with the main emphasis on resident species rather than migrants.

Documentation of the decline of diversity will be important in the continuing battle to protect natural ecosystems, thus forestry and conservation departments should keep complete permanent records of all species seen or collected by competent naturalists in the protected areas under their jurisdiction. In fact, they should even lead periodic expeditions to census wildlife populations.

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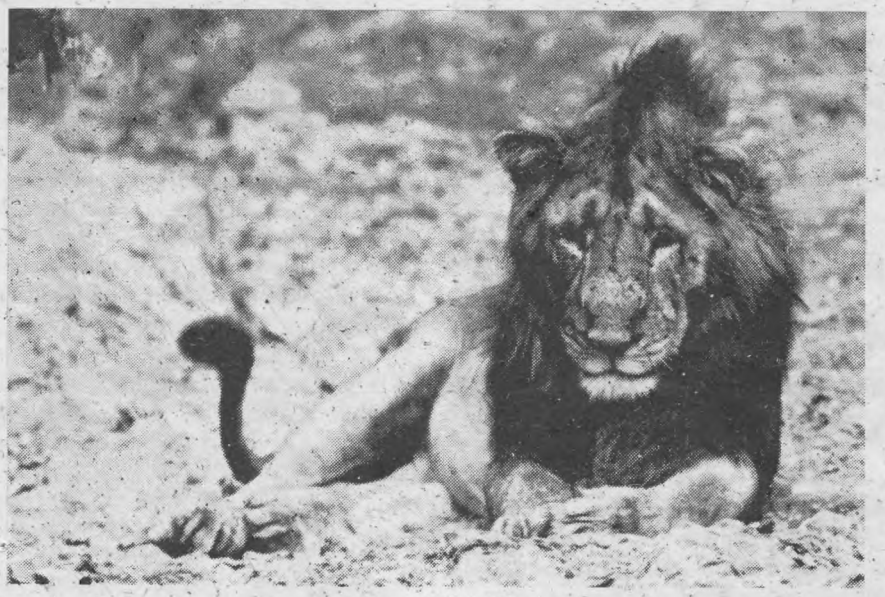

Panthera leo persica

THE GIR FOREST AND THE ASIATIC LION

Once widespread over the region, the Asiatic lion *(Panthera leo persica)* has since 1884 been confined to the Gir Forest in Junagadh Division, Gujarat State, India. An official estimate in 1893 indicated that there were 31 lions remaining in the area. Fearing that the Asiatic lion would become extinct, the Nawab of Junagadh imposed a ban on lion shooting which lasted from 1893 to 1904. The ban was lifted because lions, due to the decline in wild ungulate populations, began to attack livestock and people. However, by 1911 the availability of wild prey in the Gir Forest had increased, and the threat from, and widespread shooting of lions began to decline. In 1913 Mr. Wallinger, Chief Forest Officer of the then Junagadh State, reported that no more than 20 lions remained in the Gir Forest. As a result of this information the hunting ban was revived in 1913 and has been enforced by both British and Indian officials since then. By 1920 the number of lions was estimated to be about 50, and from 1936 to 1962 the figure was about 285. The most recent census (1968) indicated that the number had dropped to 177 individuals (Dalvi, 1969), and according to de Boer and de Joncheere (1975) this number has not changed significantly since. The Gir Forest was, therefore, established as a Forest Reserve in 1965 with the primary purpose of saving these lions.

Although a hundred years ago the Gir Forest extended over at least 4,000 square km. now only 1,265 sq. km. remain consisting of several forest types, all of a deciduous nature. On the hills of the northwestern region where the soils are red, *Tectona grandis* (teak) of about ten meters tall dominates but this open forest gradually changes into a closed teak forest in the central and southwest portions where the trees are taller (up to 15 m) and form a denser association. In the east an open deciduous forest without teak predominates where the annual rainfall is less than 60 cm. Thorn forest and savanna, composed mostly of thorny trees 4 to 8 m tall or widely spaced

shrubs and grasses, are found in the west and south-west regions while the hilltops through the Gir are dominated by grasses.

The terrain is mostly mountainous with elevations ranging from 225 to 648 m. above sea level, and is surrounded by flat agricultural land. There are five perennial and three temporary (monsoon) rivers in the reserve. The parent rock is basalt and limestone and the soil on the northern hills is mostly lateritic while in the southern and eastern areas fertile black soils are found on the forested slopes and in valleys.

There are three main seasons: a cold-dry season from October to February, with a minimum temperature as low as 1.7°C.; a hot-dry period from February to June, with maximum temperatures up to 43.3°C.; and the monsoon from late June to early October. The entire Gir area is classified as semi-arid and approximately each third year there is a drought with less than 50 cm of rainfall.

A large variety of wild animals is found in the Gir including 14 species of reptiles, 200 bird species, and 25 species of mammals. In addition to the lion, the Gir contains black buck *(Antilope cervicapra)*, four-horned antelope *(Tetraceros quadricornis)*, leopard *(Panthera pardus)*, wild boar *(Sus scrofa)*, and chinkara *(Gazella gazella bennetti)*. In addition to being the last refuge of the Asiatic lion, the reserve has considerable value for scientific research, recreation, and tourism. Ecological research in the forest was started in 1967 with the support of the Bombay Natural History Society, WWF, the Smithsonian Institution, Yale University, and the Royal Society. The results of these studies were presented at the 10th General Assembly of the IUCN in New Delhi in 1969. In 1971 the Government of Gujarat approved a list of objectives for the sanctuary in which most of the proposals of 1969 were followed. They include: preserve the natural habitat, project and increase the populations of wild animals, minimize and eventually forbid human activity within the reserve, resettle the Maldhari tribesmen outside the reserve, unify control of the reserve under one authority with sufficient power to effectively protect the area, provide a recreation area for tourists, reforestation of destroyed zones, and promote further scientific research on all aspects of the reserve.

The Gir Forest is inhabited by a pastoral group of vegetarians locally known as Maldharis whose main occupation is cattle breeding – mostly for the sale of milk. There are about 129 small settlements with about 4,800 people and about 16,850 head of cattle in the reserve. Up until 1974, when a stone barrier partially encircling the reserve was completed, some 50,000 additional cattle from the outside grazed in the reserve during the dry periods. It has thus been estimated that prior to 1974 nearly 2 million kilograms of fodder was removed from the reserve each year, and of this only about 4% was consumed by wildlife and the remainder by domestic stock (de Boer and de Joncheere, 1975; Hodd, 1970). Due to an increase in their own population, the Maldhari have destroyed a considerable amount of forested land for agricultural and domestic purposes. In addition to this, intense grazing pressure from their own as well as the cattle of outsiders has reduced the quality of grazing to the extent that wild animal populations in the forest have declined steadily during the past century. A recent study by Hodd (1970) indicates that the cover of herbaceous plants in areas which have been closed to domestic stock is 80-100% with about 2,000 kg. of fodder per hectare, while in areas grazed by these animals the density of herbs is only 30% with some 300 kg. of fodder produced per hectare.

Due to the scarcity of wild prey species, the lions are dependent upon killing domestic stock for food, and prior to 1972 the Maldhari generally resorted to the use of poison to rid themselves of cattle lifters. In 1972, however, revised legislation was established in order to compensate the Maldhari for the loss of cattle taken by lions, and since then the Maldhari attitude towards these predators has greatly improved. Further, in 1974 a 140 square kilometer *sanctum sanctorum* was established inside the reserve in which no human activities whatsoever are permitted. In addition, a programme has been initiated to move the Maldhari out of the reserve by granting each family a 3.2 hectare plot of cultivable land outside (the average holding in India is 1 hectare per family) and providing free transport of dismantled huts, personal belongings, and cattle. The primary objective is first to move all the Maldhari and their cattle out of the *sanctum sanctorum*, and when this is completed resettle those remaining in the other portions of the reserve. The entire project is hoped to be completed by 1980, and by that time the Gir Forest Reserve will become a national park.

However, Gir officials have found that as the families move out the lions which are dependent upon their cattle for food move with them, thus the number of lions in the *sanctum sanctorum* is actually decreasing. The resettlement schedule may, therefore, have to be adjusted and ecologists have suggested that a few families and their cattle be allowed to stay in the *sanctum sanctorum* for the moment to ensure a supply of food for the lions until the wild ungulates have been able to reestablish themselves in sufficient numbers.

As a tourist attraction the Gir Forest has considerable potential. Special tours are being organized at the moment bringing visitors into the

reserve and enabling them to see both lions and other wild animals. Game viewing, either from elephant back, jeeps, or watchtowers is very popular along with sport fishing (extra charge), hiking and other outdoor activities. The present accomodations which include guest houses (ca. 100 beds) and restaurant facilities are being improved. The Indian Tourist Development Corporation which manages these facilities estimates that 10,000 to 11,000 people visit the Gir Forest annually – 10% of which are foreigners.

The total number of people employed in regular service in the Gir Reserve is 474 including: 3 Divisional Forest Officers, 19 Range Forest Officers, 76 Foresters, and 200 Forest Guards. There are 1,025 km. of roads in the reserve many of which, however, are impassable during the monsoon. The roads are heavily guarded with checkpoints at 5 km intervals and 50 of these posts now have a small building. The lions are given special attention and special officials have been assigned the duty of keeping track of individual prides. The range of some of these lion trackers covers 50 to 100 square km and the knowledge these experienced men gather is contributing significantly to the understanding and conservation of the Asiatic lion.

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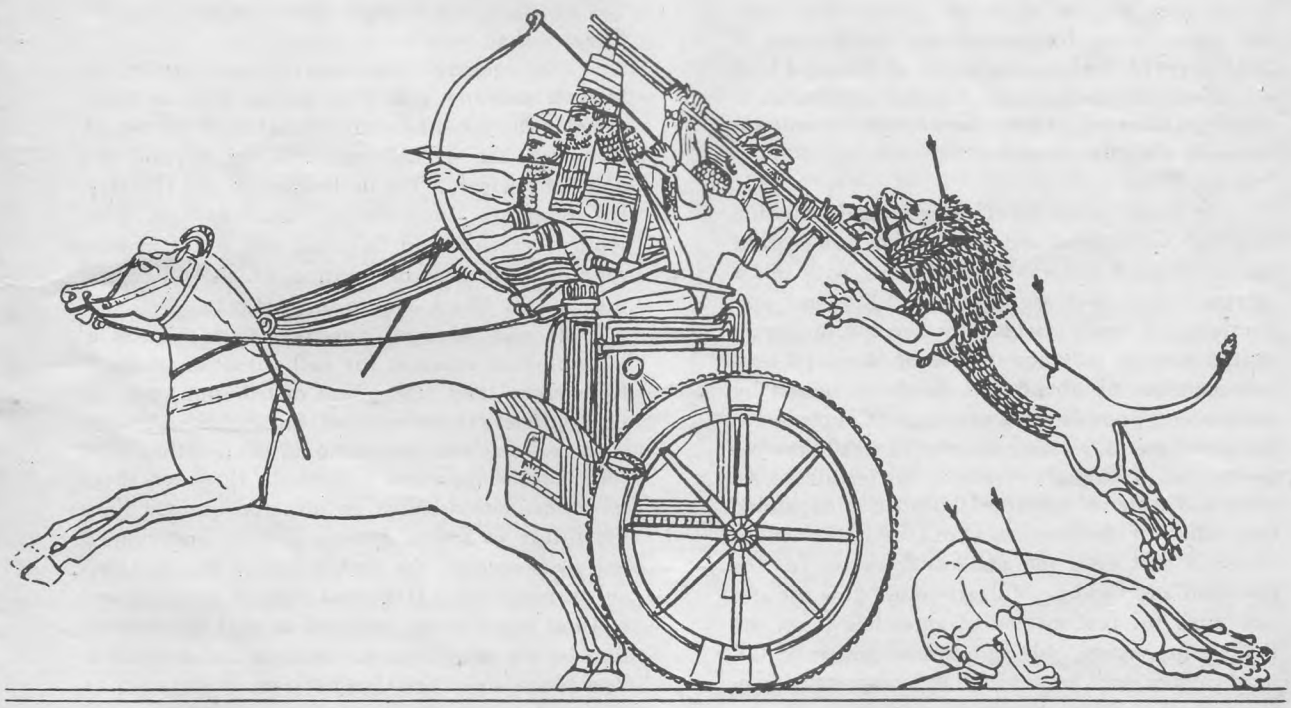

Assurbanipal on a lion hunt. An Assyrian relief, found in the ruins of Nineveh in 1850, now in London.

DESTRUCTION OF THE HIMALAYAN ENVIRONMENT

The Himalayan chain, so massive and seemingly indestructable, contains one of the most fragile and easily destroyed ecosystems on the earth. Environmental deterioration, which is causing great ecological stress to the mountain and lowland environments of Nepal, India, Pakistan, Bangladesh, and Afghanistan, was among the topics discussed at Munich, Germany in December 1974 during a meeting on the deterioration of mountain environments throughout the world.

The center of the problem in the Himalayas lies in Nepal where population pressures, misuse of the land, and destruction of forest resources have created several critical problems. In this Kingdom, with a population of 12 million people, an average hectare of arable land in the hills must support nine people. This man/land ratio is equivalent to that in Java and Bangladesh, however, in contrast to these areas, Nepal has less fertile soil and only one growing season each year. Thus, the problem is obviously more critical in Nepal and the only remaining frontier, the Terai, was opened up in the 1950's. It has been estimated that within 10 years all good farmland in this area will be occupied – after that there will be no room for expansion. From 1964 to 1974 over 77 thousand hectares of forested land have been officially designated for settlement in the Terai, however, at least three times this amount has been illegally cleared.

In recent years the effects of this destruction have been widespread and very costly. Soil erosion has accelerated remarkably and along with this a corresponding decrease in the fertility and productivity of many fields has become apparent. In the eastern hills about 38% of the total land area consists of abandoned fields – ruined by erosion and poor farming practices. Coupled with decreased yields is overgrazing and a steady decline in the use of animal excrement for fertilizer. As more and more villages are established or expanded the radius of destruction about each settlement increases and even the smallest trees are cut for firewood and fodder. Villagers must now use animal dung for fuel instead of spreading it on the fields. In essence, this widespread misuse of the local environment has resulted in a complex, downward spiral of destruction and hardship.

The Government of Nepal has taken steps to alleviate this problem with the formation of a Department of Soil and Water Conservation in August 1974. However, this Department is still small and presently quite inadequate to solve such tremendous problems. Nepal's National Planning Commission has viewed the situation as being extremely critical since, "It is apparent that the continuation of present trends may lead to the development of a semi-desert type of ecology in the hilly regions."

Indeed, the situation is so potentially disastrous that the Indian Government has encouraged and assisted the Nepalese in this problem. A similar situation also exists in several Indian States, e.g. Uttar Pradesh, Himachal Pradesh, Assam, and Jammu – Kashmir. Millions of hectares of formerly fertile areas have been eroded so severely that all the top soil has been removed. Northern Pakistan and Afghanistan, while being more arid, are also experiencing widespread destruction of their forest and agricultural resources due to overgrazing, shifting cultivation, cutting for firewood, etc. Only 3.4% of the land in Pakistan is forested while the figure, albeit never high, for Afghanistan is less than 0.1. Within the last century the forest resources of both of these countries have been reduced drastically.

The incidence of flooding in India, Pakistan, and Bangladesh has increased as a result of the destruction of the hill environments. Erosion of fertile agricultural soil has caused the silting of the major rivers and dam sites in these countries, and unless there is a combined regional effort this situation will become disastrous and seriously threaten their future.

The general consensus of opinion at the Munich meeting was that within two or three decades the mountain environments of the world, including the Himalayan, will be beyond the point of recovery. The destruction of the Himalayan mountain environment coupled with consequent erosion and flooding will result in irreversable ecological devastation which will reduce the capacity of the land to support man.

It was stressed, however, that there is a technological solution for each situation at hand. Reforms in land tenure and distribution, population and settlement control, forest and watershed conservation, and international cooperation were some of the measures suggested. However, these recommendations must be initiated quickly since the future of several nations is being undermined and weakened by the destruction of the Himalayan environment. It is vital that all political and cultural restraints be removed so that the destruction of the hills does not lead to the desertification of these rich and vital habitats.

Based on an article
by E.P. Eckholm in
SCIENCE, *vol. 189, Sept. 1975.*

Surveying a national park in Nepal.

SAGARMATHA NATIONAL PARK

by Cathy Johnson

Mt. Everest, or Sagarmatha, as it is known locally, is at 29,028 ft., the highest mountain in the world. It lies in northeastern Nepal along the border shared with Tibet. The mountain has attracted mountaineers from all over the world, in addition to many scientists hoping to discover new evidence concerning the elusive yeti which is believed to exist in the area (TIGERPAPER III:1).

Sir Edmund Hillary of New Zealand, along with the Sherpa mountaineer Tenzing Norgay, were the first persons to climb to the summit of Mt. Everest. When Sir Edmund returned to New Zealand he told tales, not only of mountains, snow, and forests; but of the Sherpa people – with their yaks, carved wooden houses, and, above all, their spirit that is at once friendly, proud, and industrious.

In early 1971, His Majesty's Government became interested in establishing a national park in the area which includes Mt. Everest. An F.A.O. consultant was sent to do preliminary studies and he reported that the area did seem to have great potential. With increased interest in national parks and wildlife conservation in Nepal, coupled with the establishment of the National Parks and Wildlife Conservation Office in 1973; Sagarmatha, together with two other Himalayan areas and one in the Terai, was designated as a proposed national park. Exploratory missions and surveys continued sporadically for the next few years in the Sagarmatha region. However, due to a lack of funds and trained personnel, no substantial development of the park could be achieved.

In May 1974 the New Zealand Government reaffirmed its interest in the Everest region (TIGERPAPER II:1) and an agreement to explore development possibilities of this region was signed, after which a team of park consultants was sent to Nepal. Primary efforts so far have been to involve the local residents in the planning of the park. Meetings have been held in which the local Sherpa leaders have been able to discuss with both Nepali officials and the New Zealand advisors such matters as boundaries, grazing, cutting rights, and development of tourist facilities.

Because the proposed park is intended to help preserve the traditional life style of the Sherpa people, as well as the natural and scenic beauty of the landscape; Sagarmatha National Park may be unique among the national parks of the world. The park will not conform to the strict international definition of a national park *(1975 United Nations List of National Parks and Equivalent Reserves,* IUCN Publication New Series No. 33) as there are too many conflicting interests. While strict geographical zonation is unlikely to form part of the final plan for Sagarmatha, there will definitely be areas of the park in which varying degrees of human activity will be allowed to continue. Some areas will be strictly for the benefit of wildlife while other areas, including the village centers, will be designated for cultivation, grazing, etc. Finally, there will be areas where there is coexistence between wild and domestic animals, for example, a pasture used by the yak in the summer would be grazed by the Himalayan tahr in the winter.

One of the first steps to be taken is to establish the boundaries of the park. Once this is done the park can be offically gazetted, and it is hoped gazettment can take place in 1976. This will then enable the government to initiate some land use controls in the park.

The New Zealand Government plans to send several more experts to the area to help determine some of these land use controls. It is hoped that a forester and a wildlife management expert will assist in the effort to determine the amount of disturbance that the area can withstand without altering the ecology and ecosystems of the area too severely. It is also expected that an advisor on park management will be assigned to Sagarmatha to help establish a visitor's center in the park. Park headquarters and the visitor's center will be built on a small hill above Namche Bazaar where the peaks of Everest, Nuptse, and Amadablam can be seen.

Development of food and lodging facilities for visitors within the park will probably be carried out by both concessionaires from the outside and local Sherpas. Presently there is one luxury hotel in the area which is operated by a Japanese firm. Visitors can also generally find simple accommodations in the homes of local residents. The continued and expanded use of this type of facility is desirable for two reasons. First, by staying in traditional Sherpa houses with Sherpa families, visitors are able to have an experience that they could have nowhere else in the world and second, this arrangement also benefits the Sherpas as it allows for more families to receive direct economic benefits from the tourists.

The proposed Sagarmatha National Park is indeed unique and is intended to be open for international tourism. It is hoped that the combined efforts of the Nepali Government, the New Zealand advisors, and the local Sherpas will result in a park which will benefit the forests, wildlife, and local people of the area and will remain as a lasting example of international cooperation and a source of pride for the Kingdom of Nepal.

the author is a U.S. Peace Corps Volunteer working in conservation education under the supervision of the National Parks and Wildlife Office, Kathmandu, Nepal.

Ovis ibex

GAME RANCHING – A PRODUCTIVE USE OF MARGINAL LANDS IN INDIA

by Shankar Ranganathan

Game ranching is the controlled propagation and utilisation of game animals, especially ungulates, for meat, hides, sport, or transfer to sanctuaries and zoos. This activity is similar in many ways to the raising of cattle, sheep, goats, poultry, etc., but since game ranching is a relatively new practice it is still much less understood than husbandry with domestic animals.

The management of wild ungulates on marginal (waste or uncultivable) land in India would provide for the productive use of an unused natural asset. Game ranching in other countries has increased protein supply for domestic consumption and export, provided employment for many people, and helped increase depleted populations of wild animals. What makes game ranching a practicable and attractive idea in India is that there is no Hindu sentiment against the cropping of game animals, whereas there are religious inhibitions which prevent the breeding of cows for beef, etc. Unfortunately, the uncontrolled reproduction and grazing of cows in India has destroyed hundreds of thousands of square kilometers of land which now can be classified as wasteland. In the State of Gujarat alone over 20% of the land is barren and uncultivable (c. 4,300,000 ha.) following the destructive activities of man and cattle. Much of these marginal lands in India is presently suitable only for game ranching operations since they can only support vegetation palatable to wild herbivores. The amount of marginal land in India is increasing each year, and along with the loss of valuable land for cultivation there is a consequent increase in erosion, flooding, and famine.

On these lands much more protein can be produced through ranching wild game than cattle. A mixture of wild animals with different food requirements is most suitable for optimum use of the land since they would not be competing for the same species of plants but complementing each other by utilising the whole spectre of vegetation available. It has been shown (Kiley, 1974) that the addition of cattle to traditional sheep pastures increases production of meat from 26 pounds per acre to 54. It is, therefore, logical to mix other species together since monocultures are, in comparison, a much more inefficient means of producing animals and animal products. Another reason for mixing species is that fecal contamination of grass by one species makes the contaminated area unacceptable to the same species, but not to other species.

Wild species which can be considered for game ranching in India include: nilgai, chital, sambar, hog deer, pig, and blackbuck. In large areas where the emphasis would be on sport shooting, in addition to these ungulates, predators such as tiger, panther, wild dog, etc. could also exist and be included in a cropping programme. The nilgai, as far as meat production is concerned, may be the most suitable animal to farm in India since it weighs up to 500–600 pounds, forms large herds, and can be partially domesticated. Most wild species have different percentages of fat and protein in comparison to domestic cattle; thus the protein yield from a wild ungulate is usually considerably higher than from domestic cattle. Frequently there is a greater proportion of meat found in the hind quarters, which is a better quality of meat, in wild stock.

For India, two types of game ranches are feasible. One would be fairly small units of 3000 to 5000 acres which would be for commercial purposes only where wild animals are reared intensively for meat, hides, or transfer. The other kind would be much larger areas of 50–100 square miles of natural area which would be used as commercial shooting areas and game ranches. Conditions in these large, natural areas would be protected from poachers, logging, and settlement. Fees charged for hunting would produce more revenue than the sale of the meat gained from cropped animals. The Rosslyn Game Ranch in Rhodesia operates in this manner (Johnstone, 1974).

As essential ingredient for the success of a game ranching scheme in India is the involvement of the local people in the project through employment, and a fair share of the benefits for their labour, e.g. meat and hides. There is no other way to prevent poaching than by ensuring the local people that they will be benefitting themselves if they help protect the game ranches and hunting reserves. If game ranching activities are initiated they can after some time be fit in as an extension of the national parks and wildlife conservation programme. Management personnel, foresters, and other specialists could be trained in these ranches and later transferred to apply their skills in developing game ranches, zoos, national parks, etc. Good management of all these places would provide a strong boost to tourism, both domestic and foreign. Expansion of parks and wildlife activities to include game ranching would create jobs for many intelligent and industrious people interested in wildlife management, and it would provide more national interest in conservation and natural history.

It is suggested that a program of game ranching be initiated for India by the regional committees of WWF in India, Indian Forest Departments, sportsmen, and wildlife enthusiasts as soon as possible. Since it is estimated that it will take at least five years before any harvesting can be done, it is recommended that the groundwork for establishing a game farm in India be initiated immediately. This includes gathering information on methods of game ranching, employing experts in the field of game ranching, and obtaining the necessary funds to start a modest pilot project somewhere in India.

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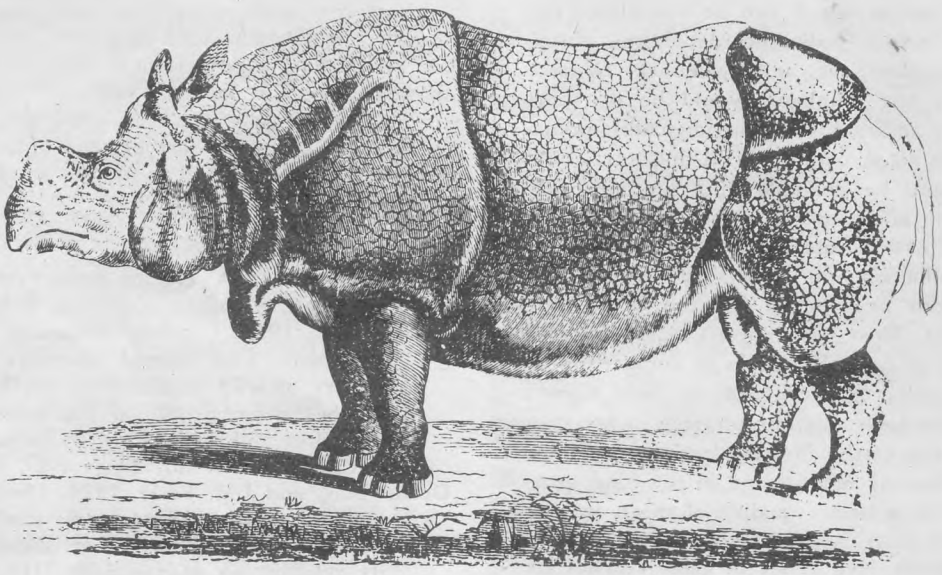

Rhinoceros unicornis

THE RHINO – MARTYR TO SUPERSTITION

by Sumati

Who says conservation measures don't work? If the planning is sincere and the eye watchful, wildlife sanctuaries might hope to duplicate the success of the Kaziranga rhino sanctuary in Assam. From a mere dozen animals at the beginning of this century, the rhino population there is now teeming with around 700 animals. It is indeed very heartening, if we also consider that, next to the giraffe-like okapi of Africa, the rhino is the most expensive animal in the world today. In India, a zoo wishing to buy a rhino must pay about Rs. 100,000; a zoo abroad must pay twice as much.

Actually, left to itself, the rhino would have few survival problems. It has few natural enemies. No predator dares attack a full-grown rhino or, for that matter, even a calf that is being guarded by its mother. And rhinos don't, seek out and attack man; rather, contrary to popular stories, when confronted, they usually prefer to rush for cover. And the rhinos rarely raid cultivated fields.

Again, left to itself...but the rhino is not left to itself. For, despite science and the so-called growing scientific attitude, no one has yet found a way to do away with superstitions.

Truly, the rhino is a martyr to superstitions, superstitions built around its horn. The rhino horn is literally worth more than its weight in gold. And it's not even a horn proper – just an epidermal outgrowth of agglutinated hair, Yet, the halo of magical properties surrounding it never seems to dim. The shavings are supposed to cure spasms in young children. Kept under the bed, it is said to ease labour during childbirth. Horn power mixed with coconut oil is said to shrink lumps, stop bleeding, soothe irritation and cure several other ailments. Rings made of the horn are said to cure piles. Some believe, a chip of the horn worn as a charm is a fail-proof talisman. And, in Europe, Popes and Kings kept cups made of rhino horns to test if their drinks were poisoned: it was believed, if poisoned, the drink would froth and even split the cup. But it is the rhino horn's supposed aphrodisiac property (in Chinese and South-East Asian pharmacopoeias) that has led to its mass slaughter – even after conservation measures were initiated. While studying the status of the Asian rhino (in 1955), Lee Merrian Talbot came across people in South East Asia who were willing to pay as much as Rs. 20,000 for a single horn. In Sumatra, he met a merchant who was ready to part with his new American automobile in exchange for a rhino.

And the halo of magic appears to have spread even beyond the mystical horn. Practically every part of the animal has been coveted. Its skin was used to make supposedly impenetrable shields. The urine was believed to be an antiseptic; and when hung in a container at the entrance of the house, it was believed to ward off evil. Apothecaries made potions from it to cure all skin diseases. Why, even now, it is sold at the Gauhati Zoo. The dry meat when chewed was said to induce immunity against dysentery.

In fact, the range of the superstitions surrounding the rhino is astounding. In Nepal, Burma, Malaysia and Thailand – the belief persisted that a sprinkle of rhino blood ensured a dying soul's happy journey. Hence, when

poachers killed the animal, they plugged the bullet holes and collected the blood. Even blood-soaked paper fetched a price. If a gravid female rhino was killed, there was great rejoicing as the fetus was a highly valued item on the eastern apothecaries' list. A small piece of rhino bone sewn into the arm was believed to make the person as strong as the animal. Many hill tribes still bury a rhino bone in fields to ensure a good harvest. Soup made from the umbilical stump, it was said, cured rheumatic and arthritic complaints. And, to top it all, in Nepal, rhino flesh and blood used to be a prize offering to the gods.

How the myths originated, nobody knows, It could be, wrote the late E.P. Gee, that the unicorn tales might have originated from the Indian rhino. Or, could it be the other way around? The mythical unicorn was believed to have used its horn to detect poison in liquids by dipping it into them. Yet, most of these claimed properties, when tested, have been found to be baseless. Poisons have been poured into rhino horn cups and none cracked. And biochemical tests carried out in Basle (Switzerland) disproved the most acclaimed aphrodisiac properties. Yet the slaughter goes on — by poachers who wouldn't hesitate shooting forest guards, too — and the horns eventually find their way to China and South-East Asia.

Rhinos (or their ancestors — the rhino family is nearly 60 million years old) were found over Asia, Europe, Africa and North America. Many of them were weeded out in the process of evoultion. Today, five main lines survive, two in Africa and three in Asia, in small pockets of their original range. All of them belong to one family, the Rhinocerotidae. The typical family characteristics are massive, barrel-like build, thick and solid bones, and short, stumpy legs with three toes. The rhinos, along with the horse family and the tapirs, belong to the order Perissodactyla, the odd-toed ungulates (hoofed animals). Though outwardly similiar, all living rhino species differ from one another in structure, possibly due to environmental adaptation a long time back.

The two African species — the black rhino *(Diceros bicornis),* and the white rhino *(Diceros (Ceratotherium) simus)* — are quite numerous. The Asiatic species, especially the Javan rhino *(Rhinoceros sondaica)* and the Sumatran species *(Dicerohinus (Didermocerus) sumatrensis)* is relatively safe in its habitats in Assam and West Bengal in India, and in Nepal. It has also been reported that a few of the Nepali animals have strayed into Bihar. All three Asian species were once found in India. The Javan rhino died out in India at the turn of the century, while the Sumatran rhino lingered on until the 1930's. Now only *R. unicornis* exists in India.

At one time the range of *R. unicornis* extended all over the Himalayan foothills — from the Siwaliks across the Indo-Gangetic region to the east. In the western part of its range, Babur had hunted it on the Kashmir frontier. As late as 1554, it was even found west of the Kotal Pass in the western Himalayas. In mid-19th century, it was still found as far west as Rohilkhand in Uttar Pradesh. Then its territory began to shrink because of habitat destruction by the growing human population. Just about 25 years ago, rhinos were found in Purnea district in Bihar, the Kosi river project finished these off. In North Bengal and Assam, rhinolands were converted to fields and tea estates. As their numbers decreased, the value of the horns shot up and the earlier hunting for sport and meat was replaced by poaching.

The first alarm about the dwindling rhinc numbers was sounded in 1904 when the rhino population had slumped to just about a dozen. The Kaziranga game reserve in Assam was set up in 1908 and the numbers were slowly built up. Nearly 700 of the 1,000 Indian rhinos alive today are to be found in Kaziranga (now made into a National Park measuring 37,822 hectares). The rest are found in scattered parts of Assam, in the Jaldapara sanctuary in North Bengal and the Chitwan National Park in Nepal.

During the rains, the Kaziranga rhinos migrate to the Mikir Hills south of the sanctuary and this is the time the poachers move in. Ever since the security measures were tightened in Kaziranga, the poachers prefer the Char Island at Orang in the Brahmaputra, Barasal, Burchapur and another island in Kurua all marshy swamps where rhinos find a natural home. After they kill the animal, they just hack off the horn, their prize.

Despite strict vigilance, poaching hasn't stopped. And, being heavily armed, poachers have killed a number of forest guards. Recently, a new anti-poaching tool has been introduced — radio surveillance. The World Wildlife Fund has donated the radio-tracking device to the Kaziranga National Park. During recent trials, two poachers (who had been digging pits to trap rhinos) were caught red-handed.

With luck, poaching may be completely stopped, but there is still another threat — disease. Some naturalists suggest that the only way to save the rhino from extinction due to epidemics would be to establish sanctuaries farther away but within the original range of the rhino. Others suggest places like the Periyar in Kerala and Mudhumalai in Tamil Nadu (adaptation may not be a problem; fossils of the rhino have been found near the Narmada and in Tamil Nadu).

As regards the sale of the rhino horns (from dead animals — on an average about 15 rhinos die of natural causes a year) by the Assam Government, some naturalists argue that such a practice will only go to further consolidate the harmful superstitions and should be done away with.

reprinted from **Science Today,** *March 1976, pp. 47-51.*

ELEPHANT RESCUE IN SRI LANKA

The Uda Walwe river valley in southern Sri Lanka is being developed for agricultural purposes, and most of the secondary scrub forest has been removed. Near the village of Angunukolapelessa there are places ranging from 50 to 200 acres which have not yet been cleared and remain as areas of dense thorn scrub. A group of about 30 elephants became isolated in this region, and since there was insufficient food for a herd this size they caused considerable damage to nearby farmlands. The farmers tried to drive them away, but the harassment resulted in making the larger elephants dangerous and several people were killed. The farmers, for religious reasons, have refrained from killing any of the elephants.

In 1974 the Department of Wildlife Conservation decided, after initial efforts to transfer three adult bulls by conventional means failed, to capture six more animals by using a mixture of the narcotic Etorphine and the sedative Acepromazine (Immobilon-Reckitts). Individuals under 2.2 meters tall were selected since handling larger animals presented too many problems. The weapons used were a Dist-Inject model 60 and a long range Palmer Cap-Chur rifle, both of which use an explosive charge to propel a dart. The 5 ml. capacity darts were of the standard Palmer design utilizing an 8.0 mm long, 5.8 mm wide cuffed needle.

Due to the denseness of the vegetation, it became necessary to approach to within 10 to 15 meters of each elephant to ensure an accurate hit. To minimize danger to the workmen two large bulldozers were used to maneuvre the animals into position. Each bulldozer carried a veterinary surgeon who fired the darts, a ranger with a rifle, and a team of 4 or 5 men equipped with ropes and veterinary equipment.

Immediately after an animal collapsed, it was positioned on its side and the trunk extended to facilitate breathing. The darts were removed and the wound treated with penicillin and corticosteroids by intramuscular injection. Each animal was then quickly secured by ropes to one bulldozer in the case of smaller animals, and to both machines with the larger individuals.

An antidote, Diprenorphine (Revivon-Reckitts), was injected into an auricular vein after each animal was secured. Two to seven minutes after the antidote was administered the animals stood up, but they remained sedated for 4-6 hours. After this time they recovered completely. In this way each animal could be walked and transported by lorries without too much trouble. Long-action penicillin was injected on the third and fifth days after capture. Fresh food and water were available continuously, and each animal was sprayed with cold water several times during the heat of the day.

Although ropes were used to secure the sedated animals, it is recommended that steel or wooden crates or even helicopters be used to avoid injury, stress, and speed the transport of captured elephants. Since elephants over about 15 years of age or 2.2 meters in height are not as suitable for capture, transport, or domestication as smaller individuals; the use of other techniques or even humane destruction to solve the problems created by these large elephants must be considered.

Drugs and Equipment Used

Immobilon: 2.45 mgms of Etorphine Hydrochloride and 10.0 mgms of Acepromazine Maleate per 1.0 ml. Available from Reckitt and Colman Ltd., Hull, England.

Revivon: 3.0 mgms of Diprenorphine Hydrochloride per 1.0 ml. Available from Reckitt and Colman Ltd.

Equipment: Dist-Inject Model 60 rifle, syringe projector made by Peter Ott and Co., Oetlingerstrasse 81, CH-4007, Basle, Switzerland. Long range Chap Chur rifle, syringe projector made by Palmer Chemical and Equipment Co. Inc., PO Box 867, Palmer Village, Douglasville, Georgia 30134, USA.

from an article by David M. Jones in ORYX *13:2, Oct. 1975*

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Elephant being rescued in Sri Lanka

MORE ELEPHANTS THAN WE THOUGHT IN SRI LANKA

We have received a letter from Mr. Thilo W. Hoffmann, President of the Wildlife and Nature Protection Society of Ceylon, along with an article by him (Loris 13:5, June 1975) which disputes the information which appeared in TIGERPAPER II:3 concerning the number of elephants in Sri Lanka.

In our article it was reported that C.E. Norris concluded in 1959 that the number of elephants there was 1,500 and a more recent study on the elephant population of Sri Lanka by George M. McKay in 1971 indicated that there were between 1,600 and 2,200 individuals.

Mr. Hoffmann contends that both of these estimates are "inaccurate and gross underestimates" and feels that a figure of 4,000, possibly 5,000, is more accurate. He attributes Norris' low estimation due to the belief that wide ranging elephant migrations occurr during certain seasons. According to Mr. Hoffmann, these migrations do not take place and as more of the country becomes opened up, elephant movements become more and more restricted. Mr. Hoffmann further believes that McKay's error stems from inadequate field work and inaccurate information obtained from others.

Indeed, in contrast to Norris' claim that Sri Lanka's elephant population is declining, Mr. Hoffmann notes that the number of elephants there has increased in the last 20 years. While it is true that elephant habitat is being destroyed at a rapid rate, in addition to killing and capture of elephants throughout the country, it is ironic that the opening up of forest habitat has also allowed more available food sources for elephants to develop. As far as food is concerned, a primary forest is a poor source for elephants. However, as these forests are destroyed or otherwise disturbed, secondary forests and open areas develop – which contain many herbs, grasses, and shrubs which elephants prefer and are easy to obtain. Thus, the number of elephants has increased in recent decades since there is more food available, even though the destruction of Sri Lanka's forests will ultimately prove to be detrimental to the nation's elephants. Therefore, while the number of elephants in Sri Lanka is increasing, the future of many herds could be dim unless effective measures are taken to transfer surplus elephants from over-crowded habitats – many of which border on human settlements – to other places where they will be able to live a normal life without threatening the interests of man.

Elephants can survive in Sri Lanka provided that adequate space for reserves, parks, and sanctuaries remains intact and well protected. Mr. Hoffmann estimates that a wild population of 2,000 to 2,500 elephants could be maintained in these protected areas, and the remainder selected for domestication, etc. and used in agriculture and other human activities. However, it is essential that plans be made as soon as possible as to the action which is to be taken with Sri Lanka's elephants.

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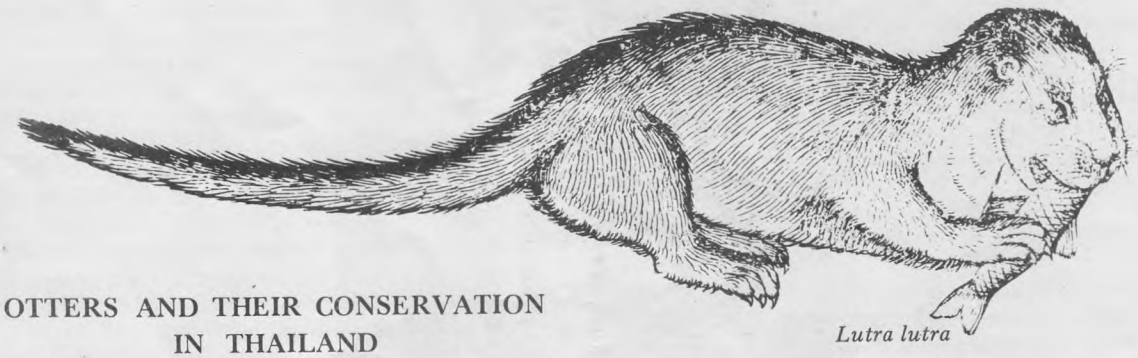

Lutra lutra

OTTERS AND THEIR CONSERVATION IN THAILAND

There are four species of otter in Thailand, viz. the common otter *(Lutra lutra barang)*, found in the mountains of the north and northeast; the smooth-coated otter *(Lutra perspicillata)*, which is found throughout the Kingdom and the most common otter of the Mekong River; the hairy-nosed otter *(Lutra sumatrana)* with a southern or southeastern distribution; and the small-clawed otter *(Aonyx cinerea)*, which is probably the most common otter in Thailand and is found in all parts of the country except the northeast.

All four species of otter in Thailand are becoming rare due to the widespread destruction of otter habitats, hunting, poisoning, plus the skin and pet trade. The problems are intensified by the lack of public understanding of conservation or sympathy for the plight of these or any other animals in the Kingdom.

Most of the wetlands of Thailand, formerly ideal otter habitat, have been drained and converted into rice fields and many large rivers are being dammed for various "development" purposes. Even though otters are now on the list of species protected by Thai law, thus cannot be hunted without a license, the law is often disregarded, and law enforcement is generally ineffective. In many parts of Thailand a favorite fishing method is to dump massive quantities of pesticides (toxaphene, rotenone, etc.) into the water to stun or kill fish. Explosives and electrical shock devices are also commonly used. Those otters or any other animals which are not directly killed or captured as a result of these inhuman and illegal practices often die of their injuries or are permanently crippled.

Since the trade in otter skins and live otters is usually a covert operation, it is difficult to estimate the annual loss of otters in Thailand. However, an average of 226 live otters were legally exported each year between 1967 and 1971, and there is no indication of a reduction in succeeding years. Unfortunately, otters suffer greatly (due to stress c from the injuries incurred during capture) during captivity and transport, and generally a very high percentage of an otter shipment arrives dead or dies shortly after arrival.

A four part program for conserving otters in Thailand has been proposed which includes: 1) Research on numbers, distribution, and population trends; 2) Education about otters, both for students and the general public (especially villagers); 3) A five year moratorium on the trade in otters and otter skins; and 4) The maintenance of otter habitat, and the preservation of all four species of Thai otters in game reserves, animal sanctuaries, and nature education centers.

This program will be pursued under a joint project conducted by the Royal Forest Department, the Association for the Conservation of Wildlife, various student conservation groups, and will be supported by various foreign institutions.

It was further proposed that the Thung Tong Reserve in Surat Thani Province, southern Thailand, be declared an otter sanctuary and become the first center where the otter conservation program in Thailand is officially recognized. An otter conservation program in Thailand will also strongly support governmental efforts to increase the effectiveness of reserves, and will also encourage the Thai Government to sign the "Convention on Wetlands of International Importance" (Ramsar, Iran, 1971), indicating the realization of Thai officials of the importance of wetland conservation.

The otter conservation program in Thailand was started with a grant from Mr. Brian Davies and the International Fund for Animal Welfare in December 1975. Close communications will be maintained with the Otter Trust (Mr. Philip Wayre, Honorary Director), the International Society for the Protection of Animals (Mr. Nick Carter, Field Officer for Asia and Australia), Friends of the Earth International, Friends of the Animals (Alice Harrington, President), World Wildlife Fund, and the Fauna Preservation Society.

TIGERTIPS

COUNTING WILD ANIMALS IN DENSE TROPICAL FORESTS

For proper management of wildlife reserves and national parks a thorough knowledge of the habits, habitats, distribution, movements, structure, and size of the animal populations is essential. One of the most important parameters for study is determining the number of individuals of various animal species present in an area and whether the population of a particular species is static, increasing, or decreasing. The techniques used to estimate the numbers of various species of wild animals are numerous and much work has been done in this field – mostly in regions with habitats open enough for direct observation of the animals (such as in East Africa, U.S., and Europe). In the Asia-Pacific region, however, direct observation of animals is rarely possible due to the dense and generally inaccessible nature of the vegetation, thus other methods must be devised here. So far very little work has been done under dense vegetation conditions and in order to assist the ambitious wildlife biologist or management officer who wishes to attempt a survey in this region a few guidelines and a list of references of published materials which could give further ideas on methods that may suit local conditions are given.

In most instances an animal population will occupy an area too large for a complete census. Thus, for example, if the number of a certain species of deer in a national park is to be studied, various sections of the park will have to be sampled in order to obtain a statistical estimate of the entire population. There are several basic sampling schemes used, and the applicability of any particular technique depends on the particular species to be studied, its habitat, and the area involved. In general, these methods rely on the random selection of samples within the range of the animal studied. If it is known, for example, that the animal prefers a particular area or habitat over another during part of the year, then adjustments in sampling technique must be made.

In populations where the distribution is homogenous it is often easier to concentrate on a few larger plots than on numerous smaller ones. In such cases efficiency may be increased by dividing each plot into smaller units and sampling each unit until the total count for the plot is completed. When large areas are to be sampled belt transects have the advantage of being easy to permanently stake out according to established reference points. These points are then relatively easy to relocate for future sampling which, of course, is essential if population trends are to be followed up. Belt transects, further, should run diagonally across the drainage pattern so that all slope exposures will be sampled. This is necessary because animal density will usually vary considerably between different vegetation types. Belt transects have proven particularly useful when estimating population numbers from fecal counts.

Counting by using direct observation is sometimes possible even under dense forest conditions, namely for arboreal species that can be detected easily through having noisy habits, e.g. monkeys Thus, primates have been successfully counted in Malaysia by the investigator walking slowly and silently along a trail in the forest and simply taking note of the number of individuals observed in the various bands encountered (Aldrich-Blake, 1975). For gibbons, birds, and other species that have regular territorial vocalizations, one can estimate the number of breeding territories simply by evaluating the number of vocalizations per day in a given area – provided that one understands the habits of the particular species well enough (Brockelman, personal communication; Chivers, 1974).

For estimations of populations of smaller mammals such as rodents, lesser carnivores, and even small and medium sized deer, methods involving capture and recapture of the animals are often useful. The so called Petersen Method involves the capture of a number of animals from the population under study which are then marked and released again in the same area. Some time later the capture procedure is repeated and the number of marked animals that appear in the second catch is assumed to correspond to the total catch in the same proportion as the total number of animals marked and released corrsepond to the total population. The method is certainly useful but has a number of limitations depending on the habits of the species under study, such as, for example, its degree of "trap-shyness" and "trap-happyness" following the initial capture. These limitations can be overcome by modifications in each special case such as, for example, using different types of traps during the second capture operation, etc.

Being infrequent defecators, carnivores, generally speaking, cannot be accurately censused by fecal counts.

Often an estimation of animal densities in an area can be determined by measuring the extent of disturbance of the vegetation following the animal's activities. Elephant feeding activity, for example, can be studied by examining trees and bushes and recording the extent of crushed undergrowth. Similarly, when elephants feed upon short grass they kick up the grass by the roots with their forefeet, thus exposing the bare ground. The amount of short grass eaten can thus be expressed quantitatively in terms of square meters of exposed earth. The same technique may also be used for other large herbivores. If it is known, for example, how much vegetation one individual gaur will disturb during a 24 hour cycle, study of the feeding sites can be useful in estimating the size of the herd.

A method which has been widely used for deer and could also be applicable to elephants and other large herbivores is the counting of the number of fecal groups deposited during a certain time in a sample plot of the area under study. If the average number of deposits for a certain species during a certain time is known, say for instance by studying the species under captive conditions, this method will make it fairly easy to estimate the size of a herd. It has thus been experienced in the United States that deer deposit an average of 13 pellet groups during a 24 hour period and studies in Sri Lanka indicate that this average is fairly true also in the tropics. In Sri Lanka further, elephants have been found to deposit an average of 14 groups of dung-piles during 24 hours.

One difficulty with this technique is, of course, that fecal material decomposes fairly rapidly under moist tropical conditions and in order to overcome this several counts must be made in the same sample area at frequent intervals to assess the speed of decomposition and thus the age of feces. In the case when old droppings remain intact over long periods of time, such as during dry conditions, pellet groups should be removed or marked in some way during the counting process.

For some species, such as carnivores which are infrequent defecators due to their intermittent feeding habits, fecal counts are less reliable indicators of population numbers. A study of tracks and sounds for these animals usually provides more accurate information. Counting tracks crossing roads or open areas of suitably loose substrate can give valuable information on animal activities, movements, and numbers. Other indirect methods include observing animal dens, display grounds, bird nests, antler rubbings and claw marks on trees and bushes, skeletons and carcasses, fur and bones in carnivore feces, runways and trails, and uneaten food scraps.

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HATCHING OF GHARIALS IN ORISSA

In TIGERPAPER II:4 we included some notes on crocodile conservation in India. Mr. L.A.K. Singh; a research scholar working with gharial conservation under FAO Crocodile Consultant Dr. H.R. Bustard, has been kind enough to send us a report on the progress made in the work described there and we are pleased to publish a summary of his report.

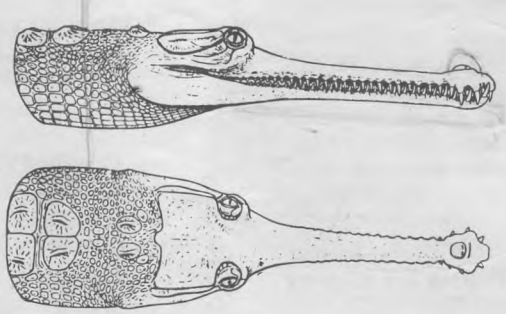
During 1975 over 60% of the gharial eggs collected at the Gandak River in Bihar were hatched in incubators at the gharial conservation center in Tikerpada, Orissa. Part of the success was due to the care that was taken during the collection of the eggs at the breeding sites and subsequent transport to the incubator to ensure that the eggs were not rotated (i.e. that the same side remained up all the time) and planted in exactly the same manner as they were found in the nests. This is necessary because reptile eggs lack the differential albumen viscosity found in bird eggs which ensures that with rotation of the eggs the embryo always remains on top of the yolk. Hence, changing the orientation of reptile eggs at an early stage of development may smother and kill the developing embryo.

The incubation period is from two to two and a half months, depending on temperature. Egg laying takes place during the summer when afternoon temperatures may exceed 45 °C and it is essential that the eggs remain cooler than this (no more than 37 °C) and at a fairly constant temperature. To achieve this an incubator was constructed consisting of brick-walled compartments filled with sand and shaded by a thatched roof to reduce ambient temperatures. In addition to this the incubator was enclosed by fine wire mesh to exclude predators. The sand in each compartment was dug in the shape of a pitcher and the eggs planted and covered with sand as in a natural nest. The necessary even temperature was maintained by the daily sprinkling of a measured quantity of water over the sand of each compartment.

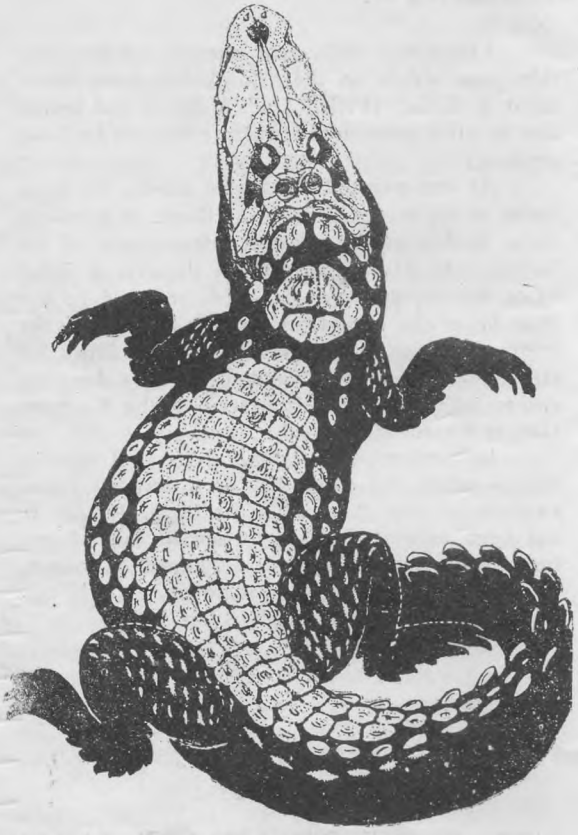
Immediately after hatching the young were kept on damp sand until the yolk sac was completely absorbed (generally after about 24 hours). They were then released into specially constructed pools measuring 2.5 x 2.5 x 0.3 meters with a one meter wide sand bank all around for basking. Each pool was made to slope from the banks towards the center and separated from adjacent pools by a 0.75 meter high partition to prevent the gharials from changing pools. A steady supply of clean water is essential and each pool has its own filling and draining system. Water from the Mahanadi River is supplied through pipes and stored in a tank but during the monsoon the river water becomes murky and then water must be taken from a well. As gharials are naturally very shy and like to hide, each pool has been liberally planted with plants providing shade as well as shelter.

As the hatchlings feed on live fish, two fish ponds measuring 1.75 x 1.75 x 1.0 meters were constructed to store some 2,000 live fish. Each time a pool is cleaned a certain number of fish is released with the fresh water into the gharial pools. The gharials initially fed only at night but as they grew older (and bolder!) and became accustomed to human activities began to feed also during the day.

Gharial hatchlings are highly susceptible to infections and sanitary conditions must be maintained. Overcrowding must be avoided and initially only ten gharials were released into each pool. All the materials entering the pools are first washed in a potassium permanganate solution to kill pathogens. Admittance to the pool area is restricted to only a few project staff who must wash their feet in the cleansing solution before entering the area and also wash their hands before and after handling each animal.



Indian Gavial (*Gavialis gangeticus*)



Crocodylus palustris

Gharials, in contrast to certain other crocodilians, usually defecate in the water, but since frequent water changes disturbs the animals the water in the pools can be changed only twice a month. During this process the bottom and sides of the pools are scraped to remove algae and other debris. Dead fish are removed from the fish ponds and the pools twice a day.

Exotermic animals, including gharials, experience markedly reduced metabolic activities in a cold environment and maximum and minimum temperatures for the pools were maintained as close to those of the river water as possible. Due to their small size, the pools tended to loose heat rapidly in the late afternoon and were roofed over with heavy duty transparent polythene covers to prevent heat loss. During days the heat of the sun is intensified by the polythene and in evenings heat is retained by covering the plastic with thick hessian cloth and the sides with specially made shutters of straw and polythene.

For more information write to Mr. Singh at:

Gharial Research and Conservation Unit

Tikerpada
Via-Angul-759112
ORISSA, INDIA

CROCODILES – AGAIN

In Vol. 11, no. 4 we included an article on the breeding of crocodiles in Thailand. Unfortunately, a few errors crept in and escaped our attention until after printing. We would, therefore, like to apologize and correct these mistakes. Thus on page 14 the fresh-water crocodile appears below in the picture and the salt-water crocodile above in contrast to what was said in the caption. On the same page we stated that the Samut Prakan Crocodile Farm has 1,800 individuals. It should, of course, be 18,000. More power to Mr. Uthai Youngprapakorn. Further, on page 17 we noted that Dr. Bustard is leading a research team studying all three species of Indian crocodile. What was referred to as *Crocodylus gangeticus* should read *Crocodylus porosus*.

Oops!

Crocodylus porosus

TIGERECHOES

Dear Sir,

Trade in birds from China

TIGERPAPER Vol. II no. 4 contains a reprinted article on wildlife in China. I would like to correct an over-simplification in the section on birds. All egrets (*Egretta* spp.) were mercilessly hunted at the end of the last century and beginning of this for their plumes; when the so-called 'Osprey plumes' became unfashionable, about 1910, the egret population, which had been reduced to a very low level, began to recover. This recovery has continued to the extent that most species of egret now breed in good numbers in south-east China (Hong Kong breeding and winter records are good evidence for this). However, the Chinese egret, *Egretta eulophotes*, has not recovered with the rest, and remains very scarce. There appears to be little trade in plumes these days; egretries in Hong Kong have not apparently suffered from this type of predation at any time during the past fifteen years.

Endangered species of waders

In TIGERPAPER Vol. II no. 1, I asked for information on three endangered species of waders. Little information has come to hand, and the following is a summary of what I can discover about distribution:

Spoonbilled Stint, *(Eurynorhynchus pygmaeus)*. Breeding restricted to a small area at the north-east tip of Siberia, where the population may number between 5,000 and 10,000. On migration and in winter it can occur throughout the Far East, but is nowhere regular; most frequent records are from Hong Kong, where it occurs roughly one year in two on migration.

Asiatic Dowitcher, *Limnodromus semipalmatus*. Breeds in isolated colonies in Siberia, and winters south to, probably, Indonesia. An increase in recent records in Hong Kong suggests that numbers may be increasing, but there is no supporting evidence from elsewhere.

Spotted Greenshank, *Tringa guttifer*. Breeds in southern Sakhalin, and winters in Malaya, possibly also Indonesia, but no records, as far as I know. Flocks of up to 33 recorded, but there are serious identification problems with this species.

Any further information would be welcome.

Saunders' Gull

I would appreciate any recent records of *Larus saundersi* from your readers. This gull, similar in size and appearance to *L. ridibundus*, the common Black-headed Gull, winters in small numbers in Hong Kong, and presumably along the coast of South China. Its breeding quarters are unknown, and little is known about its migrations and winter distrubition.

Michael A. Webster
1/F Block B. Ming Garden
Happy Valley
Hong Kong

Dear Sir,

I have read with great interest and appreciation your article on the "Chipko Andolan Movement in India" (TIGERPAPER III:1) and would like to offer some additional information for your readers.

As was pointed out in the article, the main cause of the recent devastating floods in northern India is due to the extensive destruction of the forests. In 11 of 16 northern districts in Bihar State the forest cover has been reduced to less than 1% of the total land area. In addition to the removal of the forests there are no facilities for storing water for flood control purposes along the course of any of the tributaries of the Northern Ganges descending from the Himalayas.

In northern India alone, cultivated areas in ravines where the forest has been destroyed now extends to over 3.7 million hectares. Finally, it has been estimated that the annual loss of top soil in India due to erosion is 6,000 million tonnes.

Dr. Sunil Malhotra
Hazaribagh, Bihar, India

MORE ON THE BRIDLED NAIL-TAILED WALLABY

Mr. David Waterhouse has written to us concerning Mr. Graham Robertson's letter (TIGERPAPER III:I) and would like to clarify several important points. First of all, Mr. Robertson notes that the Queensland National Parks and Wildlife Service did indeed find a colony of wallabies near Emerald in 1972 and not the N.S.W. National Parks and Wildlife Service. He apologizes for his error.

Mr. Waterhouse also says that he received a letter several years ago (we received a photocopy) from Mr. Roley Payne, head ranger of the Gibraltar Range National Park at the time, who sighted bridled nail-tailed wallabies in the Park from March to November 1967. Also, according to Mr. Payne, there was a viable colony in the Park before the 1964 Crown Bush fire destroyed them. The information on the wallaby killed by a car came from the office of Mr. A. Fox, former head of the Wildlife Division of the N.S.W. National Parks and Wildlife Service. Mr. Waterhouse personally examined the files in Mr. Fox's office and found a species list for the Gibraltar Range National Park which included information on this wallaby which was "identified by a reliable observer from the University of New England."

Finally, Mr. Waterhouse writes that the "seemingly accurate descriptions" of bridled nail-tailed wallabies in the Pilliga Scrub in NE N.S.W. have yet to be comfirmed.

TIGERNOTES

FELLOWSHIPS FOR TRAINING IN GAME FARMING

Five fellowships, with a total value of US$ 16,200, have been offered to the Indian Government under a project sponsored by UNDP and FAO for training in game farming. The proposed fellowships will enable five qualified wildlife officials from India to study game farming abroad with the intent that game farms will be established in India after their return.

Game farms in other countries have proven to provide not only valuable sources of protein and employment for both rural and urban communities, but also serve as tourist and recreational centers. Previously unproductive marginal land areas, especially in India, can be used for the farming of various animals such as partridge, quail, pheasant, deer, and fish. The training of the five officials is to include six months in New Zealand for the study of deer farms, six months for game birds in Bulgaria, Hungary, or Yugoslavia; and six months for trout farming in the USA.

ENVIRONMENTAL STUDIES FOR FOREST BIOLOGISTS

The Forestry College in Kepong, Selangor, Malaysia; under a project sponsored by FAO, has offered a course in Environmental Studies in Forest Biology since 1973. In the last two years the syllabus has been revised and the general scope of the course expanded. Present emphasis on water resources management, water pollution and flooding problems, wildlife conservation and management, and the recreational potential of forests has attracted many students. The course is part of the final year of work in a three year training program for sub-professional foresters in Malaysia.

ECOLOGY AND CONSERVATION SYMPOSIUM

A Seminar on Ecology and Conservation was held at the Wau Ecology Institute, Papua New Guinea on 4 November 1975. This symposium, chaired by Prof. K.P. Lamb, was organized to bring together parties concerned with the protection of the natural environment and natural resources of Papua New Guinea, and to discuss methods to ensure protection and wise use of these resources. Some 45 participants attended the proceedings which included the presentation of papers on the environment, wildlife resources and management, parks and reserves, fisheries, conservation, food resources, entomology, weeds, and ecology.

SUMATRAN TIGERS STILL BEING HUNTED

Mr. Marcus Borner, a Swiss biologist, has reported that the Sumatran tiger *(Panthera tigris sumatrae)* could become extinct in a few years unless strong control measures are effected to stop the slaughter of these animals. He estimates that despite protection under the law about 100 tigers are killed annually, and that the total population may be about 800. About half of the tigers are found in Central Sumatra, while the rest are scattered throughout the island. Unfortunately, very few are found in nature reserves.

Hunting for skins and trophies by villagers, officials, and foreign tourists; plus the destruction of tiger habitat has caused this alarming situation. Tigers have adapted to secondary forest habitats, and have been claimed by ranchers to take a heavy toll of livestock.

Mr. Borner recommends that the Indonesian Government establish a large tiger reserve in Central Sumatra, in addition to controlling taxidermists, initiating a nature education campaign, and establish effective law enforcement measures to preserve this tiger. Unfortunately, the two other sub-species of tiger found in Indonesia have fared worse: the Bali tiger is believed to be extinct, and the Javan tiger is represented by only about 12 individuals. Both of these sub-species are being studied by World Wildlife's Project Tiger – Indonesia.

DESTRUCTION OF ORANG UTAN HABITAT IN SUMATRA

A survey by a Dutch biologist H.D. Rijksen and his wife has indicated that there are about 15,000 orang utans in Sumatra. Borneo is the only other place where this great ape is found naturally. Mr. Rijksen has noted that natural rain forest habitat for 7,500 orang utans will be lost in 10-15 years due to logging and swidden agriculture. Therefore, the 6,000 square kilometer Gunung Leuser Reserve will become the last refuge for the surviving orang utans plus other endangered species such as Sumatran rhinos and Sumatran tigers on the island.

The World Wildlife Fund and FAO are working closely with Indonesian authorities (TIGERPAPER II:4 and III:I) on ways to ensure the future of the Leuser Reserve through the development of management plans and scientific surveys.

Sula abbotti

CONSERVATION ON CHRISTMAS ISLAND

Mr. D. Purchase, Secretary of the Australian Bird-Banding Scheme (CSIRO), has been thoughtful enough to send us more information concerning Abbott's Booby and other endangered species on Christmas Island (TIGERPAPER II:4)

A report from the Australian House of Representatives Standing Committee on Environment and Conservation includes a section entitled "Conservation of Endangered Species on Christmas Island" which was also published in the *Australian Seabird Group Newsletter,* no. 5 (November 1974).

This Committee was established to 1) examine the effect of mining and other activities on the flora and fauna of Christmas Island with special reference to bird species which are reported to be in danger of extinction, especially Abbott's Booby *(Sula abbotti)* and the Christmas Island Imperial Pigeon *(Ducula whartoni)* and 2) examine the adequacy of present attempts at rehabilitation of the rainforest following mining and to advise on any further measures which may be necessary to protect the quality of the environment on Christmas Island.

As a result of their investigations the Committee listed 23 specific recommendations which, among other items, include: 1) establishment of several permanent reserves for Abbott's Booby where phosphate mining is prohibited, 2) ultimate authority for land use on Christmas Island be in the hands of the Environmental and Conservation Committee of the House of Representatives and not the British Phosphate Commissioners, 3) strict enforcement of the laws against poaching, and revision of the laws concerning the licensing of firearms and sale of ammunition, 4) initiating a conservation education campaign, 5) restoration of mined areas to their original condition, 6) strict regulations on importing birds and other animals, 7) elimination of exotic animals preying on native species, 8) a survey of the biological resources of the island, and 9) various proposals which would regulate road building and road use, power lines, solid waste disposal, and exploitation of robber crabs, turtles, and turtle eggs on the island.

The full report (45 pages) can be obtained for A$1.65 from:

Australian Government Publishing Service
P.O. Box 84
Canberra City, A.C.T. 2600
Australia

ESSAY CONTEST – THAILAND

On 14 February 1976 the Environmental Conservation Club of Chulalongkorn University, Bangkok, awarded a number of monetary prizes to the winners of an eassy contest which was organized by the club. Two groups of contestants were established for the competition: 1) students up to 16 years of age who wrote on the forests and wildlife in Thailand, and 2) those not more than 20 years old who were requested to write on environmental pollution in Thailand.

A committee of six prominent Thais, all active in environmental and conservation affairs in the Kingdom, selected the winning essays from almost 130 entries submitted by contestants from all over the country. Money for the prizes was contributed by the German Volunteer Service (Thailand). During the award ceremonies speeches were given by the winners and a slide show on conservation and environmental problems in Thailand presented. A booklet containing the prize winning essays was also distributed. Mrs. Katharine Buri, a noted Thai conservationist, and the Wildlife Conservation Division of the Royal Forest Department were kind enough to arrange for the distribution of two books *(The Condition of the Thai Environment* and *Our Animals)* to each contestant.

First prize winners were awarded 2,000 baht (c. US$ 100), second 1,500 baht (c. $75), third 1,000 baht (c. $ 50). Numerous consolation prizes of 100 baht (c. $5) were also awarded. Mr. David Newell, Director of the German Volunteer Service (Thailand), has indicated that plans for another contest, perhaps involving paintings or poster designs with environmental and conservation viewpoints, is envisioned for 1976.

"LAST DAYS OF THE DOLPHINS?"

This exciting documentary film was recently produced for and released by the Environmental Defense Fund in an effort to stop the slaughter of these mammals by tuna fishermen. Since the early 1960's, millions of dolphins have been killed since they tend to follow tuna and are subsequently netted with them. This film is 16 mm, in colour, with sound, and runs for 27 minutes. It may be purchased for US$ 320 or rented for $ 10. To obtain this film write to:

David A. Kay
Environmental Defense Fund
2728 Durant Avenue
Berkeley, California 94704
USA

OBITUARY – TOM HARRISON

TIGERPAPER is saddened by the death of Tom Harrison (64) in a road accident in Thailand on 19 January 1976. Tom, an ardent anthropologist, first went to Sarawak as a Captain in the Royal Army in 1944 to help organize resistance against the Japanese. For this action he was awarded the DSO by the British Government. Tom returned to Sarawak in 1950 to take the post of Curator of the Sarawak Museum and Government Ethologist. He remained in this position until 1966.

In addition to being actively involved in anthropological research, especially the Niah Cave excavations, Tom was in charge of the Turtle Trust on the Talang-Talang Islands, worked with orang utan rehabilitation, and was editor of the Sarawak Museum Journal. Tom published many scientific papers in this journal and also authored **Borneo Jungle** (1953), and **World Within** (1959).

INFORMATION ON BANTENG

Gary Wiles, a United States Peace Corps Volunteer working for the Thailand Wildlife Conservation Division at Salak Phra Game Sanctuary in Kanchanaburi, is interested in making a study of banteng *(Bos javanicus)* in relation to secondary and scrub growth forests. He is particularly interested in their social behavior, such as threat, courtship and submissive displays, and in their food and habitat preferences. He would therefore like any of our readers who are familar with this behaviour or who know of any information in the literature to contact him at Salak Phra Game Sanctuary, c/o Provincial Forestry Office, Amphur Muang, Kanchanaburi, Thailand.

MONGOLIA

At the beginning of 1975 the Government of the Mongolian People's Republic decided to create the Mongolian Society for Protection of Nature and Environment.

Country-wide organizational action resulted in the satisfactory development of the Society.

By the beginning of December 1975 the number of individual members reached 175,000 and the number of institution members was as high as 1,500.

All organizations and institutions, the activities of which are connected with natural resources, have become members of this Society.

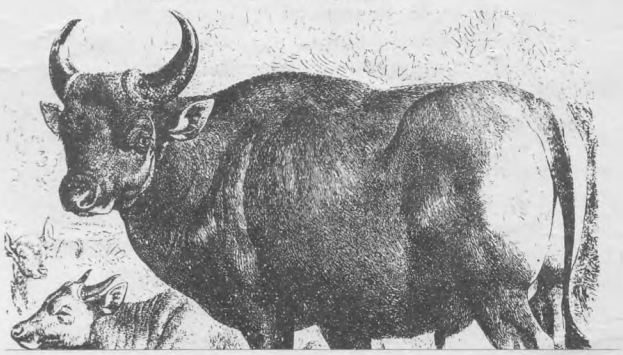
The First Congress of the MSPNE was held in Ulan Bator on 9 December 1975. Several papers were presented, general situation in the field of nature conservation and environment protection discussed and the main lines of activity for the near future adopted.

During the Congress the Society's leaders were elected by delegates as follows:

President of MSPNE	Mr. D. Maidar, First Deputy Prime Minister of MPR, President of the State Committee for Science and Technology of the Council of Ministers of MPR.
Vice-President	Mr. S. Luvsangombo, Deputy Prime Minister of MPR.
Vice-President	Mr. B. Sherendyu, President of the Academy of Sciences of MPR.
Secretary	Mr. M. Dash, Vice-President of the State Committee for Science and Technology of the Council of Ministers of MPR.

The mailing address of the Society is:

Mongolian Society for Protection of Nature and Environment c/o State Committee for Science and Technology of the Council of Ministers of M.P.R., Government House
Ulan Bator
Monglian People's Republic



Bos javanicus

NATURE PROTECTION DEPARTMENT IN MONGOLIA

A new Department has recently been set up by the Government of the Mongolian People's Republic.

Its full name and address is as follows:

Department of the Protection of Nature of the State Committee For Science and Technology of the Council of Ministers of the Mongolian People's Republic, Government House, Ulan Bator, Mongolia.

Since the main duty and objectives of this state organ is coordination, promotion and assistance of all problems connected with the protection of nature and environment in all programmes on a national and international scale, the Government's suggestion is that all correspondence related to the environment and protection of nature should be directed or copied to the above mentioned department so as to enable the Government to support the matter in question.

PUBLICATIONS

CONNECT

We have received the first issue of **CONNECT** (January 1976), which is the UNESCO–UNEP environmental education newsletter. This publication (printed on excellent quality recycled paper) is designed to provide a medium for the international exchange of information between people concerned about environmental education. Editions are also available in French and Spanish.

The newsletter, presently planned to be issued quarterly, will have a dominant theme as, for example, the Belgrade Workshop in the first issue; plus sections for notices, letters, and the activities of UNESCO, UNEP, and other governmental and non-governmental agencies involved in environmental education. **CONNECT** is edited by Mr. Joseph Barry and is available free of charge from:

Environmental Education Section
UNESCO
7, Place de Fontenoy
75700 Paris, France

For information concering the International Environmental Education Programme write to the above address or to:

Division of Economic and Social Programmes
UNEP
P.O. Box 30552
Nairobi, Kenya

DEFENDERS OF WILDLIFE

We would like to bring to the attention of TIGERPAPER readers the December 1975 (50:6) issue of DEFENDERS. This is an especially interesting issue since it contains a series of articles on endangered species, conservation, and important natural areas in Hawaii which we have found very informative. Every issue of DEFENDERS, the bimonthly magazine of Defenders of Wildlife, has articles that we enjoy. For example, the February 1975 issue includes articles on the future of lions, tigers in India, the illegal trade in endangered species, seal deformities due to pesticide pollution, the collared peccary, etc. Recent issues have also included book reviews, letters, and many more color illustrations. We feel that the annual subscription rate of US$ 10 for DEFENDERS is well spent and recommend all our readers to either subscribe for personal copies or read this magazine in libraries. For further information contact:

Defenders of Wildlife
1244 19th Street NW
Washington, D.C. 20036
USA.

BIRDS INTERNATIONAL

This is a new quarterly journal published by the British Section of the International Committee for Bird Preservation (ICBP) and is edited by John A. Burton. Editorial advisers include Lord Medway, Stanley Cramp, and C.J.O. Harrison. Each issue will contain feature articles of international interest on birds, including: bird preservation, conservation, and education; specific species, news briefs, reviews, and information about the activities of the ICBP.

Copies are available (we have received 2 issues so far) at 30p (post free) to ICBP members, from Birds International, Edward Wright Ltd., 5-7 Palfrey Place, London SW8, U.K. Each issue has 14 pages and includes both color and black and white photos.

NEWSLETTERS

PAKISTAN: **News Bulletin of the National Council for Conservation of Wildlife in Pakistan,** published by the Ministry of Food, Agriculture, and Rural Development; National Council for Conservation of Wildlife in Pakistan, Islamabad, Pakistan; mimeograph (first bulletin issued 17 May 1975). Correspondence should be sent to:

Rana Mohammad Masud
Deputy Conservator (Wildlife)
Bungalow No. 4-G, Street No. 51
F. 6/4 Islamabad, Pakistan

INDONESIA: **Indonesian Nature and Science Newsletter,** edited by Hadi Susanto and published by the Foundation for the Advancement of Science and Culture; Jalan Kalilio 17-19 Jakarta, Indonesia; mimeograph.

THAILAND:

The Association for the Conservation of Wildlife is once again publishing its journal, **Conservation News of Southeast Asia,** after a hiatus of 4 years. The journal contains both news items and articles of lasting value, emphasizing the fauna of Thailand. The journal is distributed free to all members of the Association; dues are 100 baht in Thailand and US$10.00 overseas, payable to:

Association for the Conservation of Wildlife
4 Old Custom House Lane
Bangkok, Thailand.

BOOKS, etc.

Moths of Borneo, With Special Reference to Mt. Kinabalu; by J.D. Holloway; 131 pp., 112 pp. figures plus 32 pp. plates. Available from the Malayan Nature Society, P.O. Box 750, Kuala Lumpur, Malaysia; at (M)$ 30 plus $2.00 packing and postage.

In early 1976 a guidebook **Conservation Centers for the Developing World will** be available. The book was written by former Peace Corps volunteer Ralph White under the auspices of the National Audubon Society. It contains much useful and very practical advice on how to make nature trails as well as exhibits and displays for an interpretive center. The first edition will be in English and Spanish. If you are interested write to:

Mr. Stephen Bass
Nature Center Planning Division
National Audubon Society
950 Third Avenue
New York, N.Y. 10022
U.S.A.

Common New Guinea Frogs, by J.I. Menzies, 1975. Wau Ecology Institute Handbook No. 1; Box 77, Wau, Papua New Guinea or Bishop Museum Press, Box 6037, Honolulu, Hawaii, 96818, USA; 75 pp., 12 color plates; US$3.20 (postage extra).

This is a semi-popular introduction to the frogs of the island of New Guinea. Over 50 species are discussed in some detail and illustrated in color. The species treated are selected on the basis of being widespread or representing a particular group of related species. Under each species there is a discussion of body structure, color, habitat, call, eggs, life cycle, distribution, and abundance. In addition to this main treatment, there is a general discussion of frog biology, special notes on the colors and their characteristics, a treatment of the fauna as to its composition and origin, a list of references, a guide to the identification of species, notes on preserving frog specimens, a glossary, and a list of frogs recorded from New Guinea. The book is indexed and there is a map plus some diagrams to assist in identification.

Floristics and Ecology of the Mangrove Vegetation of Papua New Guinea, by Margaret Percival and John S. Womersley, 1975. Botany Bulletin No. 8, Department of Forests, Division of Botany; Lae, Papua New Guinea. US$ 6.50 (soft cover), US$ 8.50 (hard cover).

This book provides a thorough descriptive text, keys, and numerous half tone and line illustrations of the trees found in the mangrove forests of Papua New Guinea. Since many of the species found in the mangrove are widespread, this book will prove useful for researchers throughout the Asia-Pacific region. Some 36 species are discussed in detail, and 26 are illustrated. A fold out map illustrates the more significant areas of mangrove vegetation in New Guinea and the Bismarck Archipelago.

In TIGERPAPER II:I we reported on **Wildlife – A Review** from the New Zealand Wildlife Service. The latest two issues (no. 5, 1974 and no. 6, 1975) contain more useful information mostly in the form of short articles. Included, for example, are articles on wetland conservation, New Zealand island and forest surveys, the food of oceanic birds, studies on various animals in New Zealand such as the black swan and the kakapo, and many more. There is also a listing of recent scientific publications relevant to the New Zealand area and an index to to scientific and common names in each issue.

For those who would like to receive a free copy of this interesting publication contact:

P. Morrison (editor)
Information Officer
New Zealand Wildlife Service
Department of Internal Affairs
Wellington, New Zealand

Bibliography on Medicinal Plants and Related Subjects by R. Tamson (1974), South Pacific Commission Teachnical Paper no. 171; Noumea, New Caledonia; 145 pp. Price within the SPC region $ 0.60 Aust., outside $ 0.90 Aust.

This comprehensive, detailed, and well organized booklet, in addition to listing a bibliography of the literature on medicinal plants in the South Pacific Commission area, also includes related references from Australia, New Zealand, Indonesia, Hawaii, and the Philippines. Additional entries include publications on traditional medicine, witchcraft and sorcery, drugs from the sea, anti-fertility plants, and specific plants such as *Piper methysticum* Forst. (kava) and *Areca catechu* L. (betelnut). Miss Tamson includes references published in English, French, Dutch, and German. We feel that she has done an excellent job and consider this work a valuable addition to the Tiger Library.

Hong Kong Bird Report 1974 has been published by The Hong Kong Bird Watching Society and contains reports on Hong Kong's Trade in Wildlife, Conservation of the Deep Bay Marshes, Systematic List for 1974, Birds in the Himalayas, and other items of interest. Copies are available from The Hong Kong Bird Watching Society, c/o Flat 4, 51 Barker Road, Hong Kong at US$ 1.25 (post paid).

Annotated Checklist of the Birds of Hong Kong. A revision of the original checklist by Macfarlane and Macdonald (1966) has recently been published and contains records up to June 1975. Copies can be obtained from The Hong Kong Bird Watching Society at the above address for US$ 2.35 (post paid).

MAJOR FLORAS OF THE REGION,III
(Continued from TIGERPAPER III:I)

LINE ISLANDS

Christophersen, E. 1931. **Vascular Plants of Johnston and Wake Islands.** Occ. Paper Bishop Museum 9: 13, 20 pp.

St. John, H. 1974. **Vascular Flora of Fanning Island, Line Islands, Pacific Ocean.** Pacific Science 28, pp. 339 – 355.

MARSHALL ISLANDS

St. John, H. 1960. **Flora of Eniwetok Atoll.** Pacific Science 14, pp. 313–336.

Taylor W.R. 1950.
Plants of Bikini and other Northern Marshall Islands;
Ann Arbor, University of Michigan Press; 227 pp.

MARCUS ISLAND

Nakai, T. 1930.
Plants of the Bonin Islands;
Bull. Biogeog. Soc. Japan 1, pp. 249-278.

NEW CALEDONIA

Aubreville, A. ed. 1967 –. **Flore de la Nouvelle-Calédonie et Dépendences.** fasc. 1 – 6. Paris, Musée Nat. Hist. (continuing).

Brownlie, G. 1969.
Plants de Nouvelle-Caledonie et Dependances,
vol. III, Pteridophytes; Paris, Musée Nat. Hist,; 307 pp.

Guillaumin, A. 1911.
Catalogue des Plantes Phanerogames de la Nouvelle-Caledonie;
Ann. Mus. Colonial, Marseille, 19, pp. 77-290.

Guillaumin, A. 1948.
Flore Analytique et Synoptique de la Nouvelle-Caledonie
(Phanerogames); Paris, Office de la Recherche Scientifique Coloniale; 369 pp.

NIUE ISLAND

Sykes, W.R. 1970. Contributions to the Flora of Niue. Bull. New Zealand Dept. Sci. Industr. Res. 200, 321. pp.

Yucker, T.G. 1943.
The Flora of Niue Island;
Bishop Museum Bulletin (Honolulu) no. 187; 138 pp.

PAPUA NEW GUINEA

Hemsley, W.B. 1899.
Flora of British New Guinea;
Kew Bulletin, pp. 95-126.

Johns, R.J. and P.F. Stevens, 1971.
Mount Wilhelm Flora,
A Checklist; Bot. Bull. Lae, Papua New Guinea no. 6; 60 pp.

Lam, H. 1934.
Materials Toward a Study of the Flora of the Island of New Guinea;
Blumea 1, pp. 115-159.

Manual of the Forest Trees of Papua and New Guinea 1964–1966. 9 parts, Department of Forests, Port Moresby, PNG.

PHILIPPINES

Balanco, M. 1877-1880.
Flora de Filipinas,
6 volumes, Manila.

Brown, W.H. 1919.
The Vegetation of Philippine Mountains;
Philippine Bureau of Science Publication no. 13; 434 pp.

Copeland, E.B. 1958-1966.
Fern Flora of the Philippines;
Institute of Science and Technology, Philippines, monograph no. 6, volumes 1-3; 577 pp.

Hatusima, S. 1966.
An Enumeration of the Plants of Batan Island, North Philippines;
Mem. Faculty of Agriculture Kagoshima University, Japan 5:3; pp. 13-70.

Whitford, H.N. 1911.
The Forests of the Philippines;
Bulletin Bureau of Forestry, Philippines no. 11.

POLYNESIA (General)

Brown, F.B.H. and E.Brown, 1931-1935.
Flora of Southeastern Polynesia;
Bishop Museum Bulletin (Honolulu) vol. 84, 191 pp.; vol. 89, 123 pp.; vol. 130, 386 pp.

Butteaud, E. 1891.
Flora Tahitienne;
Papeete, Impr. du Government; 128 pp.

Drake del Castillo, E. 1886-1892.
Illustrations Florae Insularum Maris Pacifici;
Paris; 458 pp.

Drake del Castillo, E. 1893.
Flore de la Polynesie Franciase;
Paris; Masson; 352 pp.

Moore, J.W. 1934
The Flora of Makatea, French Polynesia;
Bishop Museum Bulletin (Honolulu) no. 120; 49 pp.

RYUKYU ISLANDS

Hatusima, S. and T. Amano 1958.
Flora of Okinawa;
Univ. Ryukyu Ext. Ser. Bull. 15; 192 pp.

Masamune, G. 1951-1957.
Enumeratio Tracheophytarum Ryukyu Insularum;
Sci. Rep. Kanazawa Univ.; parts 1-9.

Sonohara, S., S. Tawada, and T. Amano, 1952.
Flora of Okinawa,
Preliminary Edition; Okinawa, U.S. Civil Administration and Ryukyu Forestry Bureau; 237 pp.

SAMOA

Christophersen, E. 1935, 1938.
Flowering Plants of Samoa,
Bishop Museum Bulletin (Honolulu) no. 128 (part I), 221 pp.; no. 154 (part II), 77 pp.

Christophersen, E. 1943.
A Revision of the Pteridophyta of Samoa;
Bishop Museum Bulletin (Honolulu) no. 177.

Parham, B. 1972.
Plants of Samoa;
Department of Scientific and Industrial Research, Information Series no. 85; Wellington, New Zealand; 162 pp.

Yuncker, T.G. 1945.
Plants of the Manua Islands, Samoa;
Bishop Museum Bulletin (Honolulu) no. 184; 73 pp.

SOLOMON ISLANDS

Whitmore, T.C. 1966. **Guide to the Forests of the British Solomon Islands.** London, Oxford University Press. 208 pp.

TONGA

Burkill, I.H. and C.S. Crosby, 1901.
Flora of Vava'u, One of the Tonga Islands;
J. Linn, Soc. (botany) 35, pp. 20-64.

Hemsley, W.B. 1894.
Flora of the Tongan or Friendly Islands;
J. Linn. Soc. (botany) 30, pp. 158-217.

Hotta, M. 1962.
Flora of Tonga;
Kyoto University, Japan; 197 pp., unpublished (?).

Yuncker, T.G. 1959.
Plants of Tonga;
Bishop Museum Bulletin (Honolulu) no. 220; 282 pp.

Corypha lecomtei Becc., from Prachinburi Province, Thailand. The genus is noted for its inflorescenses – largest in the plant kingdom, plus the fact that individuals of each species produce flowers and fruits just once, then die. Photo, 24 August 1975.

NEWS FROM WWF/IUCN

SOUTH EAST ASIAN APPRAISAL

The IUCN South East Asia Programme has begun with an appraisal, the objective of which is the preparation of a report on conservation in the region, with recommendations on the most effective future action. Priorities and limiting factors will be identified.

The appraisal is being carried out by two IUCN consultants, Dr. Tim Whitmore and Major Ian Grimwood. The countries covered are: Burma, Indonesia, Laos, Malaysia, Papua New Guinea, Philippines, and Thailand.

Dr. Whitmore has already prepared for the Tropical Rain Forest Programme a conservation review of tropical rain forests in Asia, with detailed reports on 20 countries. This is now being revised and brought up to date.

Dr. Whitmore has added to this a report on non-rain forest areas in the seven countries covered. Both reports describe the range of variation in the vegetation and the conservation status of the different formations.

Major Grimwood is now on a three-month field survey of the region, due to be completed in April. The object is to assess: 1) the extent to which existing conservation measures provide adequately for the conservation of fauna; 2) the adequacy of existing systems for protection of areas; 3) the effectiveness of their management; 4) how well integrated these measures are with other aspects of land use planning and management; and 5) the principal deficiencies of, limiting factors for, and opportunities for conservation in the region.

Throughout the appraisal, information and advice is being sought from the region's Governments, IUCN Commission members, and IUCN member organizations in the countries concerned. There has been a gratifyingly good response from the latter. Close contacts are being maintained with the UN agency members of the Ecosystem Conservation Group, UNEP, FAO, and UNESCO. The Joint Projects Committee of Survival International and the Committee for Indigenous Peoples is adivising on some of the development implications of conservation proposals that might be made.

Between May and July 1976, Dr. Whitmore and Major Grimwood will prepare a joint report, incorporating the findings of Dr. Whitmore's review. Major Grimwood's survey, and the consultations with the organizations and individuals mentioned above, together with other correspondents.

Their report will describe the state of South East Asian conservation and make recommendations for an action programme. It will include an assessment of the kinds of action that are most likely to succeed. At this point, IUCN will begin the process of project selection so that an integrated series of projects may be developed in cooperation with the governments concerned for funding by bodies such as the WWF.

THREATENED PLANTS COMMITTEE

A secretariat for IUCN's plant conservation programme has been established at the Royal Botanic Gardens, Kew and initial work has started towards defining and coordinating the basic objectives of the organization.

The secretariat, headed by Mr. Grenville Lucas, is working on three basic plant conservation projects: survey and evaluation, protection and rescue, and public awareness.

The first of these goals, pursued by what is known as the Threatened Plants Committee (TPC), is to compile a list of threatened plant species along with known distribution, abundance, centers of endemism, and current threats to each species. This index is being compiled on a regional basis, e.g. the Smithsonian Institution has completed a list of threatened species for North America, and a listing for Europe (excluding the USSR) is expected from European collaborators by September 1976. North Africa and the Middle East will be surveyed next.

Protection and rescue operations are being undertaken by various sub-committees in North America, Europe, the Middle East, and North Africa. Country representatives are also situated in the USSR and in Latin America. In addition, several specialist groups are being formed which will handle the problems of special plant groups, e.g. tree ferns, palms, orchids, succulents, etc. The job of the people associated with this phase of TPC is to identify and document any changes which threaten floras or species, and to prepare and submit recommendations to various governments in an effort to thwart the destruction and extinction of numerous species of plants.

The third objective of the TPC is to initiate and maintain a campaign of public awareness of plant conservation. So far, the response from various institutes, universities, and botainc gardens to the need for conserving many plant species has been heartening. Support for the TPC is wide-

spread, and one of the resolutions of the 12th International Botanical Congress held in Leningrad last July emphasizes the need for international cooperation in plant conservation.

A conference held at Kew last September noted that botanic gardens can assist greatly in the propagation, cultivation, and distribution of rare and endangered plant species. The need for establishing such gardens throughout the world, especially in the tropics, was given considerable attention.

Finally, the TPC is gathering information concerning what plants are protected, various laws, and how many nations are approaching the problem of plant conservation. The TPC is currently interested in just how those nations which have signed the Convention of International Trade in Endangered Species of Wild Fauna and Flora (presently 22) have approached the matter.

WWF "PROJECT 1180"

In TIGERPAPER III:I we reported that a special project for the promotion of conservation education has been started by the WWF. This "Project 1180", headed by Mr. Mark N. Boulton, has progressed considerably in recent months. Facilities are now available at the project headquarters for the production of high quality slide and filmstrip programmes at relatively low cost. Since slide projectors, especially in tropical countries, seem to be more readily available than movie projectors, Mr. Boulton is preparing a series of educational programmes using 35 mm slides. Projectors can be improvised, and the script for each programme read. So far three slide programmes are available: "It's Their World Too" consisting of 80 or 150 (dual version) slides, is about the work of the WWF; including a presentation of Operation Tiger, the tropical rain forest campaign, endangered species, captive breeding, etc. The second set of 75 slides is entitled "Why Conserve Wildlife", and the last is "African Wildlife" with 60 slides.

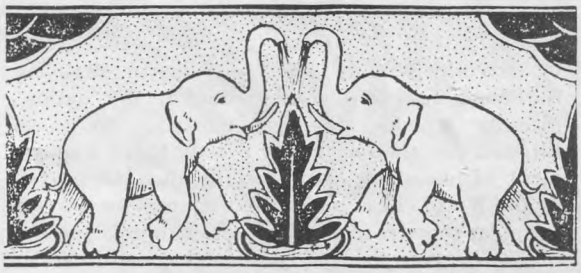
As a general guide line, 80 plastic mounted slides with a typed script will cost about US$ 6.00 plus postage. For more information contact Mr. Boulton at:

Brockelbank
Butts Lane
Woodmancote, Cheltenham
Glos GL52 4QH
England

A NEW FILM FROM WWF

World Wildlife fund – Malaysia has recently released the second of its wildlife films "Last Stronghold – The Unknown Jungle". We have been informed that this is an extremely good film with some spectacular sequences, especially of the Helmeted Hornbill, the Giant Flying Squirrel, and the Great Argus Pheasant displaying in the wild. Copies of this film and their first film "Forest From the Dawn of Time" are available for educational purposes at a price of £175 per copy or £325 for both films. For more information contact:

World Wildlife Fund – Malaysia
PO Box 769
Kuala Lumpur, Malaysia
or
I.D. Television Ltd.
Suite 24, Craven Lodge
15 Craven Hill
London W2 3ER, England

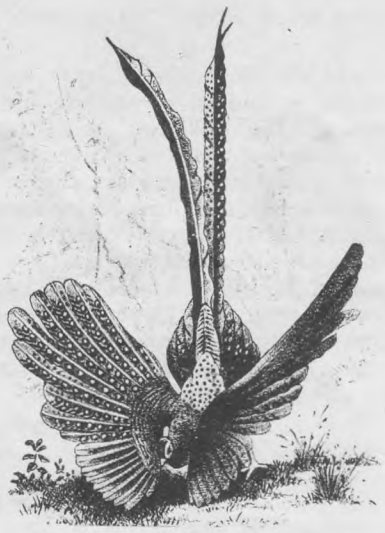


ELEPHANT TASK FORCE

Elephant populations over most of their range are on the decline. The Southern Region Committee of the World Wildlife Fund – India in Bangalore, has recognized this trend and established an Elephant Task Force to study and help conserve the species. The Task Force is to determine the status of the elephant in the southern States of India and to coordinate conservation needs with the WWF "Operation Rain Forest" project. Information on the number, distribution, habitat requirements, movements, and poaching pressures (for ivory) will be compiled and it is hoped that eventually a "Project Elephant" will be established in an effort to gain more support for elephant conservation.

The Task Force consists of a group of energetic and dedicated individuals from various governmental offices and conservation groups. If TIGERPAPER readers have any information relating to elephants in the southern States of India please write to:

WWF – India, Southern Region
269 Rajimahal
Vilas Extension
Bangalore 560 006
India



PHEASANT TRAINING SCHOLARSHIPS – PAKISTAN

World Wildlife Fund – Pakistan, realizing the need for bird conservation in the nation, recently arranged for two nationals to go to England for training in the breeding and management of pheasants. A third individual, supported by the World Pheasant Association, may be sent on a similar three month training mission this year.

The two trainees, Javaid Igbal and Rehman Nawaz Khan, were put through a rigid training schedule which included incubation techniques, nesting and feeding procedures, medical care, tagging and conservation methods, and scientific harvesting of pheasants.

MORE ON PHEASANTS

Mr. Keith Howman of the World Pheasant Association (WPA) has written to inform us that the WPA is anxious to give every possible educational help to trainees in pheasant conservation and pheasant aviculture from countries in the Asia-Pacific area. Officials from wildlife departments in this region are encouraged to contact the WPA about this matter.

Mr. Howman also stressed the need for information concerning the number of pheasants of each species throughout the Asia-Pacific region. Information of this kind is not available. It is, however, felt that in most cases the numbers are falling dramatically due to the destruction of pheasant habitats and uncontrolled hunting. He would be most grateful to receive any information concerning the numbers, species, location, and trends of any pheasants in the Asia-Pacific region. Enquiries concerning the WPA training proposal and information on pheasants may be sent to Mr. Howman at:

Ashmere, Felix Lane
Shepperton, Middlesex
England

WORLD PHEASANT ASSOCIATION NEWSLETTER

We recently received the first issue (October 1975) of this interesting bulletin and feel that it fills a gap concerning the spread of information about pheasants throughout the world. Since the establishment of the World Pheasant Association on 20 June 1975, the WPA has achieved a great deal (see TIGERPAPER 11:4 for background information). For further information concerning joining the WPA and subscribing to the WPA Newsletter write to the:

World Pheasant Association
Daws Hall
Lamarsh, Bures
Suffolk C08 5EX
England

NATURE CONSERVATION–INDONESIA

A Foundation for Nature Conservation was established in 1975 to assist the Indonesian Government in educating the people to ensure the protection and conservation of nature and its resources for future generations.

The Foundation has already initiated several projects including the publication of two nature magazines (for children between 4-10, and 10-20 years of age, respectively), quiz and essay contests with monetary prizes; lectures, tours, and audio-visual presentations; and production of various posters, pamphlets, and books.

Since this Foundation is a non-governmental organization, its budget is quite limited and all funds for their activites come from private donors. The TIGERPAPER whole heartedly supports the Foundation for Nature Conservation and other groups with similiar objectives from the Asia-Pacific region, thus we encourage our readers to assist these groups in any way possible – with money, literature, expertise, etc. For more information concerning the Foundation for Nature Conservation write to their Secretariat at:

Jalan Minangkabu 34
Jakarta, Selatan
Indonesia

from **Defenders,** *Feb. 1975.*

Printed at United Production by Nai Chavalit Chaitirapinyo. 1976